HOW TO IMPROVE WOOLEN AND WORSTED MILL OPERATIONS

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Textile World

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HOW TO IMPROVE WOOLEN AND WORSTED MILL OPERATIONS

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Rapid changes in textile technology affecting woolen and worsted mill operations have made it hard for any one man to acquire a rounded knowledge from his own experience. To keep abreast of changing techniques requires a knowledge of the methods and ideas of other men in the field.

This book is designed and edited to provide you with that knowledge by bringing you a wealth of woolen and worsted experience taken directly from the pages of TEXTILE WORLD.

These articles and data - representing only a fraction of the valuable material and help you receive as a subscriber to TEXTILE WORLD - offer you a wide range of practical and useful aid on every phase of woolen and worsted operations.

We believe that the use of this book, in combination with your own experience and the current issues of TEXTILE WORLD, will help you solve more successfully many of the varied operating problems you encounter day to day.

The editors wish to express their appreciation to the hundreds of textile men whose practical wisdom and ingenuity are represented on these pages.

THE EDITORS

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Why TOP-BREAKING Machines Are a Logical Development

▶ The American system of worsted spinning broke down the barriers and created the need for short wools, which became more and more in demand

▶ Gilling and drafting developments have improved sliver variation, and top-breaking machines may give the uniformity in staple length that is so necessary

By FRANCOIS E. CLEYN

President, Spinners Ltd., and Consulting Editor, TEXTILE WORLD

On the following pages you will find descriptions of top-breaking machines and mill-installation stories illustrating their use.

To properly place these machines in their true perspective, we should consider some of the events leading up to their development.

The American System Proved Itself in Three Ways

The thinking of the men who operate the worsted branch of the textile industry has changed drastically because of the American system. Although this system was received with a great deal of skepticism when it was first introduced, three basic facts have been clearly established:

1. Good yarn can be produced with a minimum of operations and doublings.
2. Wool can be subjected to long drafts under certain conditions without any deterioration in yarn quality.
3. The introduction of new types of machines has enabled the worsted industry to increase workloads and reduce costs considerably.

This progressive thinking by the yarn mills and the machinery manufacturers has yielded excellent results, but only moderate progress has been made in the closely allied combing section of the industry.

How Spinners and Combers Have Worked Together

Combed wool is still the basic material of the worsted industry. Yard-to-yard evenness of top and uniformity of staple length are essential for the conversion of top into yarn on any system.

Very little has been done to improve the comb itself, but progressive combing plants have installed stop motions on gill boxes and have adopted pin drafters or gill reducers after combing. These developments have made it possible to deliver a more-even sliver as measured by yard-to-yard variation.

But the American system also demands uniformity in staple length as well. Shorter wools previously used only on the French system have become more and more in demand. As a matter of fact, certain types of wool formerly sold at a discount in the world markets now often bring a premium.

The combing plants have found it increasingly difficult to satisfy the needs of American-system spinners. But the spinners could not compromise, because even slight differences in top make a tremendous difference in running qualities and yarn appearance.

Developments in two directions were therefore prompted by the above situation:

1. Roving and spinning frames were changed to accommodate tops of longer staple length.
2. Machines were developed to "square" tops, or break the longer fibers.

What You Can Expect Of Top-Breaking Machines

Now we're back to the top-breaking machines. Don't expect any miracles from them.

The need for careful sorting has not been eliminated. However, a troublesome small percentage of long fibers can be eliminated, and a good-running top can be produced.

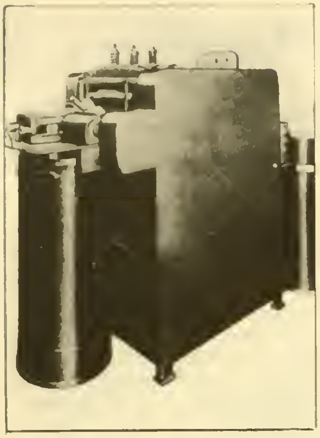
The success or failure of top-breaking machines will depend on the following factors:

1. Weight of sliver fed
2. Percentage of fibers that require breaking
3. Position of the top-breaking machine in the set

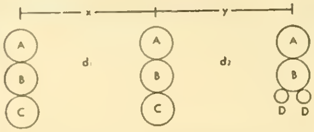
The revolution in worsted yarn manufacture, which started with the evolution of the American system, has been given important assistance by the introduction of top-breaking machines.

This special report was compiled and edited by James H. Kennedy, Southern Editor, TEXTILE WORLD.

SOUTHWELL SIZER



SIZER has three sets of rolls on the standard model and does not drive the middle roll through the stock but positively by contact from the top fluted roll. Roll face is 16 ins., and production is about 300 lbs. per hr.



Roll sizes and range of settings are as follows:

Draft is adjustable from 0 to 20 in each zone.

Front-roll speed is 0 to 1,350 ft. per min.

Rolls *A*, *B*, and *C*, are of 3-in. dia. *B* is rubber covered and the others are scratch fluted. Rolls *D* are 1 in., scratch fluted.

Setting *x* is adjustable from 3 to 18 ins.; *y* from 2¾ to 18 ins.

The Southwell Sizer, a top-breaking machine developed after over three years of work by Robert Leslie, Sr., superintendent, and Robert Leslie, Jr., is now being marketed by Southwell Textile Machinery Research Corp., North Chelmsford, Mass.

Drafts are usually from 0 to 15, and production is about 300 lbs. per hr.

The Sizer is equipped with three sets of rolls, and a fourth set can be added if desired. The top roll in each set drives a composition-rubber roll below it by friction. The top roll is geared directly to the single bottom fluted roll; so no power is transmitted through the stock in process.

Top-Roll-Drive Is Not Through the Stock

It is this principle of driving the top roll that is the heart of the machine. Not only is accurate fiber breaking thereby possible, but high draft and high production with good evenness are also practical.

The nip distance between the front and the second sets of rolls—where fiber breaking takes place—can be set as low as 2¾ ins.

Front-zone draft is adjustable from 0 to 20, and back-zone draft from 0 to 20. Total over-all drafts up to 400 are possible.

Sprocket-and-chain drives are used to facilitate adjustment of the roll stands to the staple array of the stock fed and delivered.

Roll-Face Width of 18 Ins. Gives 16-In. Working Space

Roll pressure is applied through springs and adjusted by bolts that are screwed down to increase nip pressure.

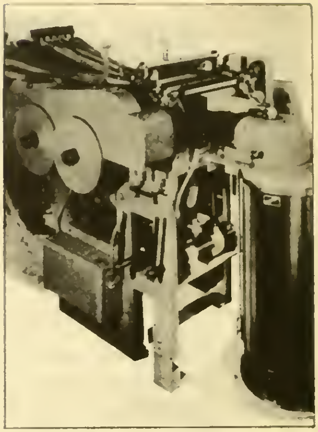
The working width of the rolls is 16 ins.

The middle roll is an Accotex J490 cot fitted to a steel roll. Lapping is said to be minimized with this covering.

Other features of the machine are: self-aligning ball bearings; front and back stop motion; electrical knock-off; and start, stop, and jog switch.

Single or multiple can delivery, coiler, or balling head can be furnished with the Sizer.

HOLDSWORTH



TOP BREAKER is a conventional intersecting gill box equipped with an extra three-roll set of front rolls that form a breaking section between fallers and coiler.

A combination intersecting gill box and top-breaking machine is now available from Holdsworth Gill Screw Co., 55 Sabin St., Pawtucket, R. I.

The extra set of rolls added to the front of a conventional gill box allows fiber breaking to be accomplished on a regular production machine.

Minimum draft on the Top Breaker is 8 (on a regular intersecting gill box it is 6.5), and maximum draft is 15.

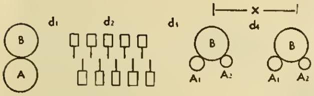
Why a Faller Bed Is Used To Help Break Top

Theory behind the development of the machine is this: In order to break fibers properly, the fibers should be thoroughly parallelized and presented to the breaking rolls as a web. It was, therefore, a natural development to put the breaking section at the front of an intersecting gill box.

The extra set of delivery rolls—which duplicate the regular three-roll take-off—consist of a 2½-in. Accotex-covered roll riding on 2½-in. and 1¼-in. fluted rolls.

A TEXTILE EQUIPMENT NEWS FEATURE

TOP BREAKER



Roll sizes and range of settings are as follows:

Draft—d_1, d_2, d_3 adjustable from 2.5 to 5; d_4 is fixed at 3.

Front-roll speed is 60 to 120 yds. per min.

Rubber-covered rolls *B* are 2½ ins. in diameter. Scratch fluted rolls A_1 and A_2 are 2½ and 1¼ ins. respectively.

Setting *x* is adjustable from 2½ to 6 ins.

Fibers can be broken to have a maximum length of 3¾ to 6 ins. The rolls can, however, be tailored to break down to 2½ ins. if desired.

Draft in Breaking Section Is Fixed at Three

Front-roll speed is 120 yds. per min. Width of the rubber rolls is 13⅛ ins., of the steel rolls 13⅝ ins., and setover of the fallers is 12½ ins.

The rolls are spring weighted and feature an easy-locking cam lever.

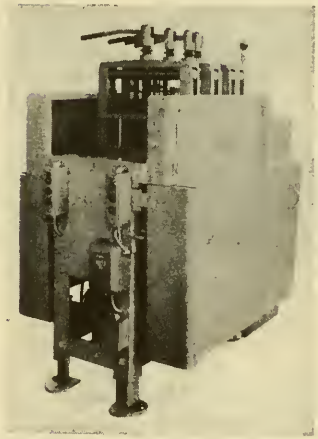
Speed ratio of the two sets of front rolls is fixed at 3 to 1; so draft in the breaking zone is 3.

The rubber roll is a fabric-lined cot with a ½-in. Accotex J490 covering.

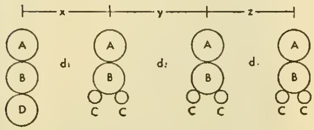
The Top Breaker also features: pressure fittings throughout; roller bearings on all rolls; and the usual stop motions for feed, fallers, delivery, and production.

Delivery is into a coiler to achieve maximum poundage per can, and one- or two-can delivery can be furnished with the single-head machine. The machine can be equipped with either can or ball creel.

BERKER SQUARE TOP ATTENUATOR



SQUARE TOP ATTENUATOR has four sets of rolls and drives the middle rubber roll from the top fluted roll. Roll pressure is very high, as are speeds and drafts.



Roll sizes and range of settings are as follows:

Draft—d_1, d_2, and d_3 are each adjustable from 0 to 6.

Front-roll speed is 100 to 800 ft. per min.

Rubber-covered rolls *B* are of 3-in. dia., rolls *A* are also 3 ins., and rolls *C* are 1½ ins. *A* and *C* are scratch fluted. *D* is 3 ins., scratch fluted.

Setting *x* is adjustable from 1½ to 10 ins., *y* and *z* from 2½ to 10 ins.

High draft and high production characterize the Square Top Attenuator, a top-breaking machine being sold by R. C. Berker Co., Inc., Thornton, R. I.

Drafts up to 216 are said to have been accomplished, and production has been increased between 300 to 400 lbs. per hr.

Four sets of rolls are used, and in each case the scratch-fluted top roll drives a rubber roll beneath it by frictional contact. The top roll is positively driven through gears from the bottom roll. The friction drive to the rubber roll assures constant surface speed regardless of roll diameter or the type or condition of the stock being processed.

Machine Can Break Fibers To 1½ Ins. Maximum Length

Fiber breaking takes place between the front and second sets of rolls. The setting is from 2⅛ to 10 ins. on the standard machine, but the unit can be tailor made to break down to 1½ ins.

Drafts are adjustable from 0 to 6 in each of the three drafting zones; so the maximum theoretical draft is 6x6x6, or 216.

Sprocket-and-chain drives allow easy moving of the roll stands to adjust for fiber length desired.

The bottom rolls for all except the back set of rolls are two small fluted rolls. The double nip enables closer setting for fiber breakage and allows the fibers to be gripped securely.

Pressures and Speeds Are Very High

Up to four tons of pressure can be applied to each set of rolls through a spring system with a cam-action lever for easy loading and unloading.

Minimum front-roll speed is 100 ft. per min., and the maximum is 800 ft. per min.

Working width of the machine is 14 ins. across the roll faces.

The rubber roll is a steel arbor to which a ½-in. thickness of a composition material has been vulcanized. Hardness is 85 to 90 on the Durometer.

Other features of the Square Top Attenuator are: roller bearings on all rolls, ball bearings on all other shafts; all-steel welded frame of heavy construction; interchangeable parts; all grease fittings; indicator light to denote a stop; electronic knock-offs on front and rear; yardage-counter knock-off.

The machine can be delivered with a balling head or with coiler delivery into up to six cans. Either ball or can creel can be furnished.

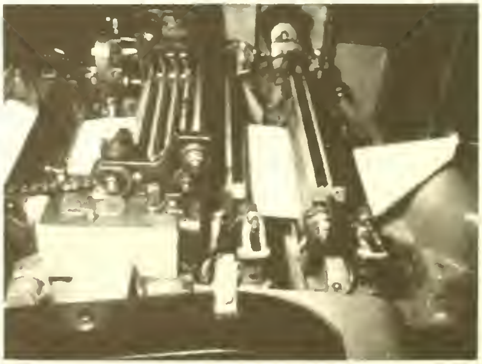
SIZER is used at Southwell's after French or Noble combing and either to break top or as a drawing process

CAN DELIVERY is used on this model, but other Sizers are equipped with coiler and ball delivery. Felt covered clearers prevent lapping

At Southwell Combing Co.—

▶ Southwell's Sizer has proved itself in production and is being used on wool, mohair, and synthetic blends.

TOP BREAKER is in the set right after French combing—can creel and single coiler delivery—and puts out about 130 lbs. per hr. One gill reducing follows as the final operation



FALLER FIELD (left) distributes the stock evenly and presents no bunches to the breaking section (right). Mill added guide bar and has no trouble with static

At Carvill Combing Co.—

▶ Holdsworth's Top Breaker, in full production, is increasing the limit spin and improving evenness.

CAREFULLY ENGINEERED top breaking is enabling Carvill Combing Co., Moosup, Conn., to increase its customers' limit spin up to 10%. The Holdsworth Top Breaker is in the set right after French combing and is followed by a finisher gilling.

As Henry Haskell, president of Brunswick Worsted Mills and treasurer of Carvill, put it, "Look at this overgrown 62-64s Australian we had to run. It would have been impossible for us to do a good job without breaking the top on this machine. As it was, Brunswick spun this lot into 45s."

"Or take this lot of 64s. Brunswick was having some trouble in spinning because a few of the fibers were longer than the ratch we had to set. So we just ran the rest of the lot through the top-breaking machine and spun it into 45s—and in colors, too."

A little experimenting was necessary to find the best

TOP BREAKING is being done as either the first, second, or only operation after French or Noble combing at Southwell Combing Co., North Chelmsford, Mass. Its machine, the Southwell Sizer, was developed right at the mill and has been in mill production for over a year.

The Sizer, which inventors Robert Leslie, Sr. and Jr. refer to as a "fallerless gill box," is producing at the rate of 250 to 300 lbs. per hr. in regular production.

Here's a Typical Layout Including Top Breaking

Let's look at an example in which the top-breaking machine is used as the second operation after combing.

The first operation after combing is an intersecting gill box that has 25 comb ends behind it and produces a 5½-oz. sliver at 170 lbs. per hr. on 64s stock.

Then comes top breaking. (Or the machine can be used as a regular drawing operation without breaking.) Twelve ends of the 5½-oz. sliver are fed to the Sizer, and one 5-oz. or two 2.5-oz. ends are delivered on balls. Production is 300 lbs. per hr.

As the first operation after combing, the Sizer is used this way:

The Noble comb delivers a 1-oz. end at 40 lbs. per hr. with 16% noil on 64s stock.

Twenty-five of these comb ends are fed to the top-breaking machine, and a 5-oz. end is delivered into a can. Production is 300 lbs. per hr. In this case, the average staple length before breaking was 6 ins.; after breaking it was 3¾ ins.

The finisher gill box that is used as the last operation takes six ends of broken top and delivers two ends of 2½-oz. top on a ball.

Evenness Results Are Encouraging

The Sizer does not harm evenness and, in many cases, improves it considerably.

For example, in the case where the machine is used as the second operation after combing, unevenness from the first gilling was 21% average and 30% maximum on the Pacific tester.

Putting 12 of these 3½-oz. ends through the Sizer (draft of 9.0 and production of 300 lbs. per hr.) resulted in a 4½-oz. end with 10% average and 14% maximum unevenness.

Reports from spinners using these new tops confirm the tests at the combing plant. Particularly good results have been obtained on the cotton spinning system with stock broken to 1¾ or 2 ins. on the Southwell Sizer.

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place in the set to put the top-breaking machine. Carvill tried it before and after combing and found that the process was ideally suited for the first gilling after combing.

On 70s wool, the French combs deliver a 3¾-oz. end with about 10% noil. Production is about 15 lbs. per hr.

Eight of these 3¾-oz. ends are put up behind the top-breaking machine. Draft in the faller section is about 3.08 and in the breaker section 3.0; so total draft is 9.24. Production off the Top Breaker is about 130 lbs. per hr.

The last operation is a gill reducer that takes eight ends of the 3½-oz. broken sliver and makes two balls of 2⅝-oz. top. Production is about 150 lbs. per hr.

Some of Carvill's top is spun next door at Brunswick Worsted Co., with which it is affiliated. Experience there has shown that an undyed broken top should rest for at least 10 days for best spinning results. The fibers naturally have to be stretched before they are broken, and this waiting period gives them a chance to become relaxed again.

Dyeing, however, (through the action of the hot water) hastens the relaxing. Dyed tops can be spun right away without trouble.

The job of breaking top isn't as easy as it sounds. John Ramsey, president and works manager, who worked with Holdsworth in the development of the Top Breaker and has had the first production model in operation for over eight months, had to develop his own methods.

For instance, no two lots break alike. Even if the machine is set with the nips of the breaking rolls 4 ins. apart, fiber strength and elongation determine just what the finished staple array will look like.

Many staple arrays have to be made before the optimum setting is made for each wool. Just the long fibers should be broken; the machine shouldn't be forced to break fibers shorter than the level portion of the staple array.

Some wools are rougher on the machine than others. A Delaine, for instance, is stronger than an Australian and causes the machine to heat up more quickly.

Length in grade doesn't mean so much any more, and the top futures market is thus feeling the effect of top-breaking machines.

The high roll pressures required for breaking help to reduce vegetable matter in the top by acting as miniature crushing rolls.

A broken or squared top looks finer than it actually is; the longer, coarse fibers are gone. But each long fiber makes two short fibers, so a micron count may show the top to be actually coarser than before breaking.

Evenness—a very important point to watch in any process—is not affected with the Top Breaker.

At Ames Textile Corp.—

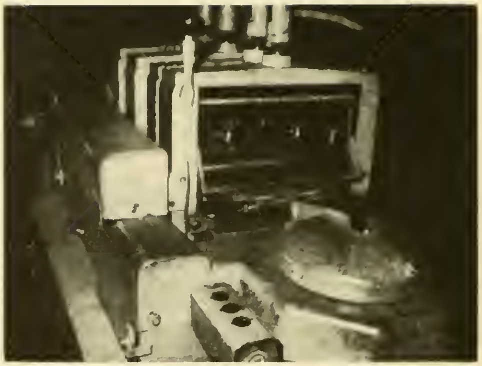
► **Berker's Square Top Attenuator has been run experimentally at 200 lbs. per hr. with good evenness results.**

PILOT-PLANT TESTS at Ames Textile Corp., Lowell, Mass., indicate that the Berker Square Top Attenuator may take its place as the first operation after combing to break top or to act just as a drafting and evening process.

Production at the rate of 200 lbs. per hr. has been obtained experimentally, and Fritz Kobayashi, quality-control supervisor, believes that machine efficiency will be at least 80% in production.

You can only feed so much bulk at the back of any

SQUARE TOP ATTENUATOR is in the pilot plant at Ames and has been used to break wool and other fibers.



THIS SINGLE-COILER MODEL has broken top at productions equivalent to 200 lbs. per hr. with excellent evenness results.

machine, and space for cans or creel is also limited. That's why theoretical drafts and production figures have to be considered from a practical angle.

The practical solution toward which Ames is working is this: feed as much as you can, and try taking off a lighter end.

What Ames Found Out About Top Breaking

The machine can be set precisely, but the nip setting is not the same as the maximum fiber length by array. The relationship between setting and fiber length varies with the stock being processed. In the range of 54s to 60s wool, however, there is no difference between nip setting and maximum fiber length.

Static can be troublesome, and a radium static eliminator came in handy during August. Also, plain steel bars above the roll nips helped to prevent the billowing that might lead to lapping.

Roll weighting should be kept as low as possible to minimize roll wear. But you've got to have enough pressure to keep breaking efficiency high. Experiments have been run with pressures up to 2,800 lbs.

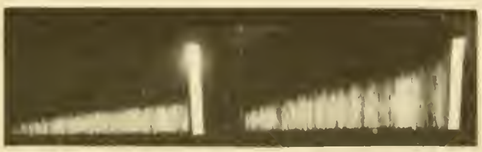
In one experiment, lowering the pressure from 2,800 to 2,200 lbs. meant that 0.2% more fibers between 4½ and 5½ ins. got through, even though the front ratch was 3¾ ins. Front-roll speed was 210 ft. per min. That fifth of a percent might spell trouble in spinning.

Evenness of broken top is considerably better than that of a comparable unbroken top. For instance a 58-60s lot had 15% unevenness (Pacific) before breaking and 11% after.

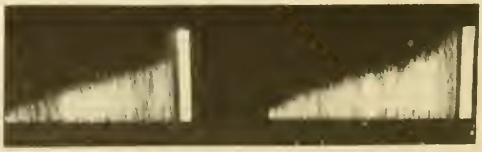
Staple Arrays Show Results of Top Breaking

► These three sets of staple arrays were made under the direction of Prof. James H. Kennedy, Jr., Lowell Technological Institute, and show typical examples of top-breaking results at each of the three mills—Carvill, Ames, and Southwell.

CARVILL lot of overgrown Australian wool had a 6-in. maximum length before breaking and, after processing on the Holdsworth Top Breaker, showed a 3¾-in. maximum length.



SOUTHWELL lot of 64-70s had a maximum length of 5½ ins. before breaking and finished with a maximum length of 2¼ ins. after a run through the Southwell Sizer.



AMES 58-60s MV shows up with a 6-in. maximum length (3.36-in. average) before breaking on the Berker Square Top Attenuator. Finished maximum length is 4¼ ins., and average is 2.61 ins.

Answers on Finishing
WOOL-SYNTHETICS BLENDS

Here are answers to some questions on the difference between finishing wool blends and all-wool fabrics:

- **Crabbing eliminates wool-nylon dye creases**
- **Raising may be aided by chemical means**
- **Shrinkproofing increases resistance to abrasion**

Q. Are wool blends burled in the same manner as all-wool fabrics?

A. Yes, except that more care is necessary. Wool-synthetics blends do not close up as well as all-wool fabrics, and improper burling may cause holes.

Q. Can the standard all-wool scouring reagents be used on wool blends?

A. Yes. However, alkali should be used with caution, for some synthetic fibers are sensitive to alkali.

Q. How about the scouring machinery?

A. In general, standard equipment is effective. Fabrics, though, that have a large viscose content should be treated on lightweight machines to prevent damage.

Q. Is the scouring shrinkage less in a wool blend than in an all-wool fabric?

A. Not necessarily. Some wool-viscose blends shrink even more than all-wool fabric.

Q. How about crabbing wool-synthetics blends?

A. Avoid excessive tension and alkali concentration. Keep the pH as close to 6 as possible.

Crabbing is useful in blends containing a high percentage of nylon; if not crabbed, these fabrics may develop undesirable, permanent creases when dyed on a beck.

Q. How does the nature of the blend affect fulling shrinkage?

A. Shrinkage is affected by the types of fibers present in the blend and by the coarseness of the fibers; as the denier of the viscose becomes greater, the shrinkage increases. Also, the system by which the yarns were manufactured affects the shrinkage; for example, the shrinkage is greater in a wool-viscose worsted than in a wool-viscose woolen.

However, unless the acetate, viscose, or nylon content exceeds 30%, the fabric will shrink like an all-wool cloth, except in heavily crabbed goods. The shrinkage, of course, is also affected by the conditions of the fulling operation.

Q. How is the fulling action influenced by the blend?

A. Fulling is reduced by the presence of nylon and acetate. Viscose, unless it is present in large amounts, has no effect on the nature of the wool.

The fulling action seems dependent upon the swelling of the fibers; acetate and nylon do not swell, whereas viscose does. Therefore, to improve the fulling action of a wool-acetate blend, the acetate should be swelled. The pH of the fulling moisture also affects the fulling action.

If the structure of the fabric is not designed for heavy fulling, such a treatment causes the wool fibers in the blend to pill and create a permanent change in the appearance of the dyed fabric.

Q. How can a wool-synthetics blend be made shrink resistant?

A. By the use of resins or by chlorination. Chlorination is more effective on blends than on all-wool fabrics. A shrink-resistant treatment also increases the resistance of the fabric to abrasion and pilling.

Q. Is it necessary to treat wool-synthetics blends for crease resistance?

A. It is not necessary unless the blend contains more than 30% viscose. Acetate or nylon, when present, generally eliminates the need for a crease-resistant finish, especially if the blend contains at least 50% wool.

Q. How do the synthetic fibers in the blend influence raising?

A. Fabrics containing acetate or viscose are difficult to raise well. In a wool-acetate blend, the raising operation brings both fibers to the surface of the fabric. However, the wool component can be raised if the fabric is treated with an agent that softens the acetate (phenol, formic acid). After the excess softening agent is washed out, the fabric can be raised as usual.

Raising is affected by the method used in dyeing the fabric. In union dyeing, especially, the neutral action of the process affects the wool component. For effective raising, as many treatments as possible should be carried out in acid media, and the fabric should be slightly acidified before raising.

Raising produces interesting effects on fabrics containing nylon waste or staple in the filling. When raised, such a fabric shrinks in width, becomes dense and heavy, and loses the cold hand associated with nylon.

Q. How is a fabric of a wool-synthetics blend pressed?

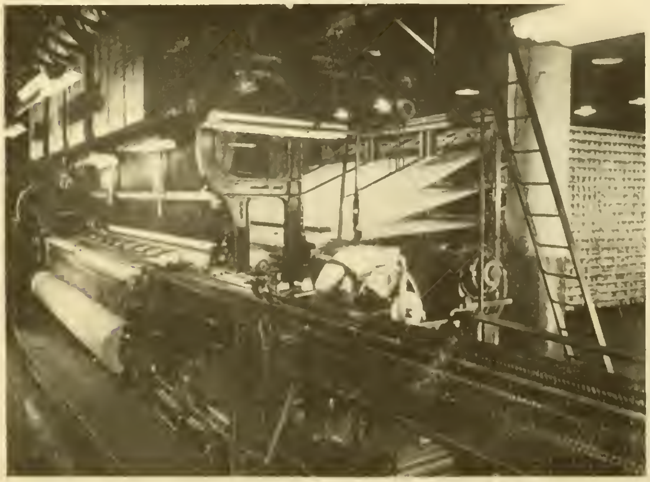
A. By standard methods after it has been brushed and steamed. After being pressed, the cloth should be stored in a cool place.

Based on a paper by C. S. Whewell at the International Congress for Unity in Textiles.

THE CREEL for the cone warper was made at Artloom and handles a total of 288 wool or cotton ends creeled end to end. The operator is Katherine Beresford.

CONE WARPING reaches a speed of 175 to 200 yds. per min. on wool yarns and 250 yds. per min. on cotton yarns. Gladys Wall ties up a broken end.

Weave Wool and Cotton CARPETS On the Same Looms



THE LANSDOWNE LOOM (or wire loom), designed to weave wiltons, weaves wool or cotton carpeting interchangeably. The weaver is Harry Landenburger.

The loom-motion changes and settings commonly necessary in changing from wool to cotton are eliminated at this large carpet-weaving mill. The engineers and mechanics of the plant have mastered the trick of changing from wool to cotton carpeting, and vice versa, and end with exactly the same type of carpeting on both materials. Only two loom changes are now necessary—

- The setting of the harness cams
- The binder warp beam and the creeled ends

By RICHARD B. PRESSLEY
Associate Editor, TEXTILE WORLD

THE AXMINSTER LOOMS (C&K), ranging in width from 27 ins. to 12 ft., make jacquard patterns in all colors. The weaver in front is Robert Killian.

WEAVING COTTON CARPETING on wool looms and then weaving wool carpeting on the same looms again is all in the day's work at Artloom Carpet Co., Inc., Philadelphia, Pa.

The main function of Artloom's completely equipped and staffed machine shop is to keep looms modern so that all the new color and style combinations in both wool and cotton carpeting can be woven efficiently.

Winding and Warping

Wool yarns for Artloom's carpets come from its Greenville, N. C., plant or from other outside sources.

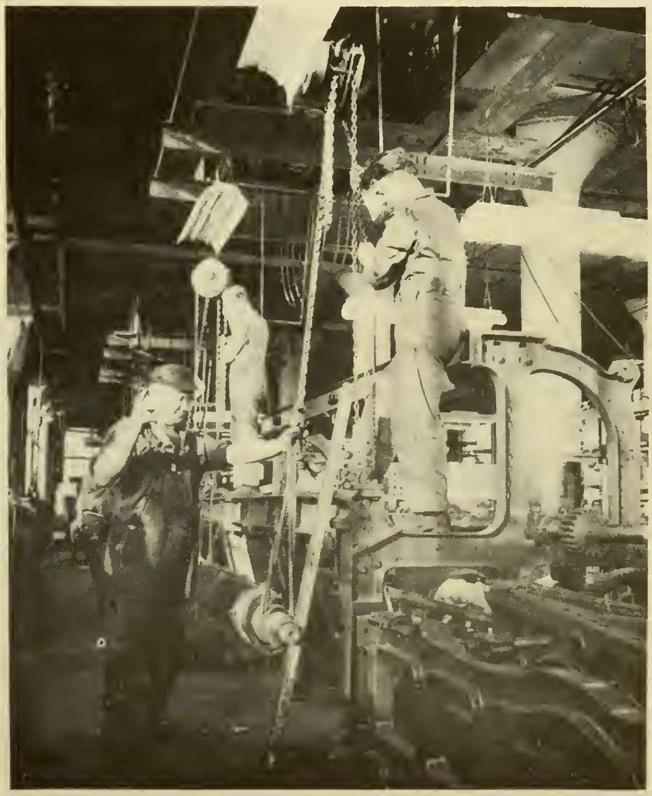
Most filling yarns are 15-lb. jute. A cotton-jute 14-lb. combination is also used.

All filling yarns are received at the plant on cones and are wound for the looms on Lazenby cop winders. Each cop is wound 416 yds. in length, and each one contains 94% usable yarns; the other 6% is wasted at the looms, where all filling is changed by hand.

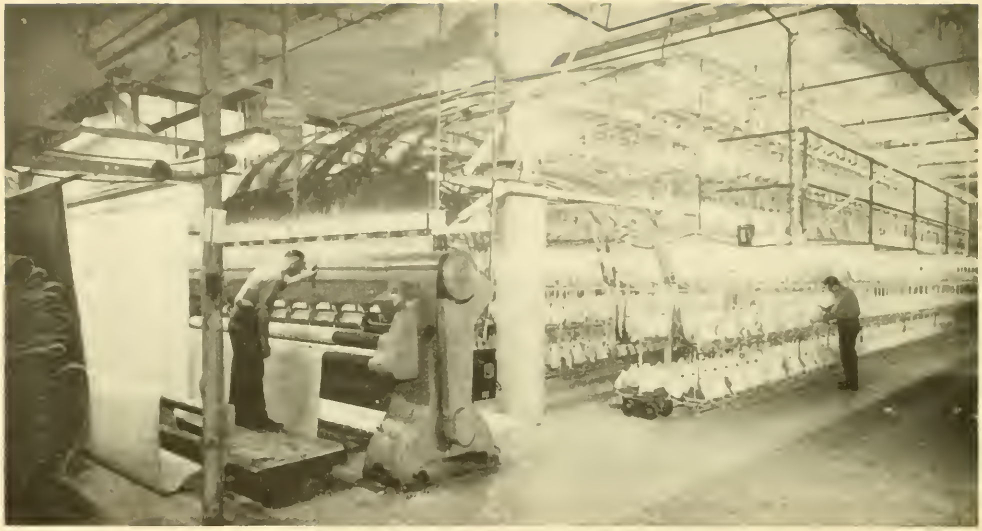
Warp yarns are also received at the plant on cones. Twisted-wool warp yarns are 3/33s and 2/47s. Soft-wool warp yarns are 2/50s and 4/25s. Cotton warp yarn number is 7/3.

Cones of warp yarns are creeled on an Artloom-made creel and are warped on a Davis & Furber high-speed cone-type warper. The capacity of the creel is 144 ends on each side for a total of 288 ends.

The warper is run at 250 yds. per min. on cotton yarns and at 175 to 200 yds. per min. on wool yarns. No change in individual-end tension is



TWELVE-FOOT CARPET LOOMS were made from 9-ft. velvet looms by Artloom's own designers and mechanics right on the weave-room floor.



THE TUFTING MACHINE is drawing double-creeled ends straight from the creels and placing the loops into the jute backing at 550 rows per minute.

necessary in changing from cotton to wool yarns.

To change from wool to cotton, or vice versa, the creeled cones are run out and the speed of the warper is changed; that's all the changing necessary.

Beaming

Warps are beamed by rolling the coned drum of yarn down a track to a beamer made by Warp Compressing Machine Co. As soon as the drum is moved from the creel, a second one takes its place so that there is no loss of warper production.

The beamer is driven by a 5-hp. Westinghouse Life-Line motor and is equipped with a Reeves variable-speed drive.

Cotton and wool warps for all types and widths of looms used are processed on the warper and beamer.

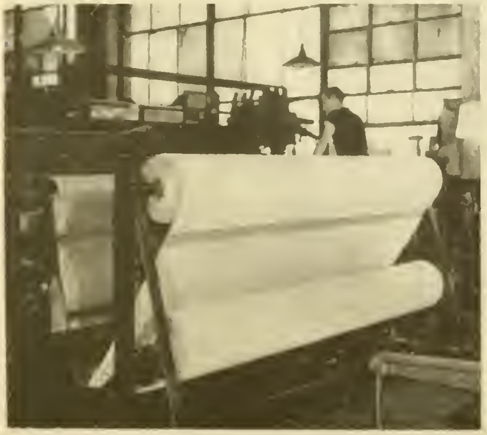
A kraft-paper yarn used as a stuffer in weaving is slashed on a conventional six-cylinder slasher with Ceremel C (a wax-base sizing material) mixed with pearl starch.

Cones of the kraft paper are creeled directly into the slasher.

Weaving

Artloom has 113 carpet looms ranging in width from 27 ins. to 18 ft. The 27-in. looms operate at 72 ppm.; the 18-ft. looms run at 34 ppm. There are few 27-in. looms; most are 12 ft. wide.

The axminster looms, manufactured by Crompton & Knowles Loom Works, have been altered less than



COTTON OR WOOL CARPETING is woven on the "shaft" looms two rolls at a time. The pile fabric is split on the loom to make the two fabrics.

IN THE BURLING ROOM, carpeting is perched and mended as it is run over automatically operated electrically driven frames built by Artloom.

any other loom at the plant in Artloom's program to alter looms to make better rugs.

However, the loomfixers have designed an electrified copper bar that stops the looms when the warps become too slack or too tight.

The 12-ft. axminster looms run at 41 ppm.

Lansdowne Looms Make 12- to 15-ft. Carpeting

Artloom also has a large number of looms manufactured by Lansdowne Steel & Iron Co. The wire loom (it's called that at Artloom because a flat steel wire is inserted into the open warp shed, beaten into the cloth, and then pulled out of the cloth to form the pile) is driven by a Morse positive drive connected to a 5-hp. motor. Timing of the wires is a critical adjustment.

These looms are 12 to 15 ft. wide; most of them are 15-ft. looms. The speed on the 15-ft. looms is 34 ppm.

One warp beam is used for the binder, and another is used to supply the stuffer. Pile-fabric ends come from creels mounted behind the warp beams. The ends are tensioned with weights.

The binder and stuffer harnesses are driven by cams, and the pile-fabric ends are controlled by jacquards.

Artloom inventive touches on the Lansdowne looms include a bell-and-counter arrangement that notifies the weaver on a loom exactly where a broken warp end is located and also records the number of breaks.

The Shaft Loom Is Artloom's Own Baby

Another loom at Artloom, a "shaft" loom, has been altered more than other looms to make the carpeting desired. Originally 9-ft. velvet looms, the width has been increased to 12 ft. by mill engineers and mechanics.

All shuttles on all looms at the plant are hand threaded by the weavers. A small hand press is mounted on one end of most looms to press the cops of filling into the shuttles. Each weaver on wide looms tends one loom.

All looms are set so that the change from wool to cotton means only a change in harness-cam setting, warp for the binder, and creeled ends.

After carpeting is woven, it is run through a tiger machine and then perched and burled.

One Tufting Machine Operates At 550 Rows per Minute

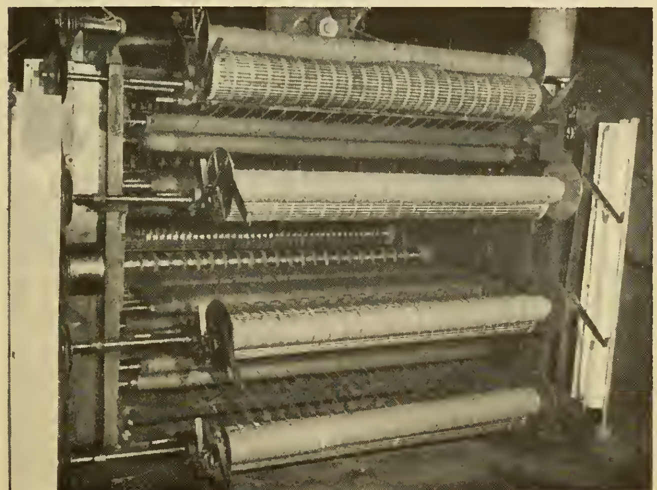
A 12-ft. tufting machine has been added to the plant to make cotton rugs of the twist-loop type at a speed of 550 rows of loops per minute.

Highly twisted cotton yarns are fed to the needles in the tufting head from creels at the back of the machine. Cones of yarn are creeled in pairs to keep the machine running constantly.

The tufts are inserted in a woven jute backing material purchased already woven outside the plant. The tufted rugs are the only rugs, wool or cotton, that aren't woven with a stuffer and backer commonly used to weave wilton carpeting. (Axminsters have no stuffer, of course.)

All carpeting is completely finished at the plant and shipped from there to company warehouses for distribution.

Lights Beside Doffer Aid Woolen Carding



TWO FLUORESCENT LIGHTS—one on each side of the doffer section of a woolen card—improve visibility greatly and help both quality and production by lighting the dark rub-apron area. Apron condition is easier to check, and broken ends are not so hard to find and piece up.

Mothproofing of Wool Is Done in the Dyebath

Technical Editor:

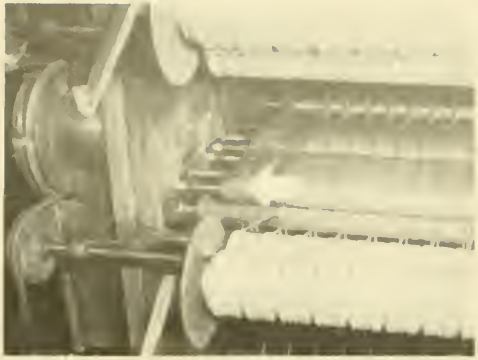
We find cuts in our cone-wound worsted yarn that appear to have been made by some moth or insect. The cuts sometimes go 1 in. deep, but we find no trace of moths. What insect would do this and how can we prevent this condition. (9723)

Carpet beetles do this damage to untreated wool. They even attack the yarn from the inside of perforated cones so that no damage can be seen on the outside of the cone.

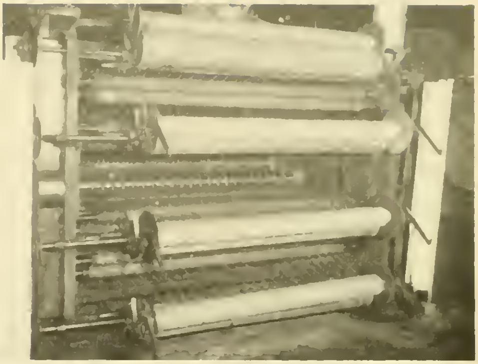
The best remedy is to treat the yarn with a mothproofing agent that can be applied in the dyebath during dyeing. No extra operations are involved, and there is no change in the other properties of the treated yarn. Dyestuff makers usually supply mothproofing agents.

Any stock of goods that has not been mothproofed can be successfully treated with paradichlorobenzine, which is tossed into each package or container. Since this chemical evaporates and gives no further protection, it must be renewed every two months.

A treatment with DDT provides excellent protection against insect damage for several years.



LEATHER BUTTONS are riveted to the apron edges to prevent lateral slippage. The edges are not built up as high as the composition facing so that the edges do not rub together.



NEW 60x60-IN. CARDS are equipped with double aprons with 10-in. centers. Older 48x60-in. cards at the Thompsonville plant have triple aprons with 7¼-in. centers.

Composition Wool-Card RUB APRONS Increase Production and Reduce Soiling

▶ Bigelow-Sanford has been running composition-rubber rub aprons for six years on 56 cards

▶ With 15 colors in process, the biggest advantage of the aprons is the elimination of the soiling problem

▶ The aprons give more rub, and card production has been increased 20%

By THOMAS B. WINSTON
Assistant Editor, TEXTILE WORLD

SUCTION PIPE takes away waste end to keep it from wrapping around the ends of the apron. If an end gets wrapped around a leather button, the button will tear and the apron will stretch.

FIFTY-SIX WOOLEN CARDS have been running with composition-rubber rub aprons for the last six years at Bigelow-Sanford Carpet Co., Inc., Thompsonville, Conn. According to E. W. Galinat, superintendent of yarn making, card production is 20% higher and the problem of apron soiling has been licked.

The Thompsonville plant has four sections of cards, 14 sets to a section. Three sections are Davis & Furber 48x60-in. cards equipped with triple aprons on 7¼-in. centers, and one section is 60x60-in. cards with double aprons on 10-in. centers. On these four sections, 15 or more colors are in process at all times; so the absence of the apron-soiling problem is a big advantage. The leather aprons absorbed oil and bled out.

The Thompsonville plant uses no emulsion on its stock, and it had a problem of getting enough rub with leather aprons. The leather aprons would dry out; if they were oiled, oily ends became a problem.

The original purpose of developing a rubber apron was to eliminate the use of oils on the leather aprons; but to everyone's surprise, the test aprons provided more density in the roving. Since the composition aprons provide more rub, the condenser speed was increased to get more production; a larger pulley was put on, and the pinion was changed on the tap drive.

As a result of the increase in roving density, jack-spool capacity increased about 20%, and the spinning spools are changed less often than before. The Thompsonville plant makes a 1- to 1½-run carpet yarn and uses a total draft of 30%.

Bigelow-Sanford has found that the aprons work satisfactorily with all-wool stock, wool-and-rayon blends, and 100% rayon stock. Static has been no problem; the Thompsonville cards are equipped with ion-neutralizer static eliminators.

Experiments Started in 1936

Bigelow-Sanford started experimenting with rubber aprons in 1936. Later Boston Woven Hose & Rubber Co. was called in to help with the development work. Over the next five years, 1,100 experimental aprons of 17 different types were constructed and tested. The apron that finally worked out has a canvas back with a surface made of a mixture of butadiene-acrylonitrile copolymer, which resists animal oils, and polymerized chloroprene, which is softened by animal oils. The mixture gives a proper balance between coefficient of friction and durability.

Along the inside edges of the

aprons, rows of riveted leather buttons grip the roller to prevent lateral slipping. To prevent the rivets from becoming loose, the canvas backing is built up with bias-cut strips of varying widths. The step-down construction gives a good bond and prevents cracking between the surface facing and the canvas backing. As a further precaution, the composition facing is built up higher than the reinforced edge, which keeps the apron edges from rubbing together.

Aprons Last Over Two Years

Depending on the number of shifts running, the maximum life of the composition aprons is between two and three years. Mr. Galinat reports an average running life of around $2\frac{1}{2}$ years.

One cause of apron failure is a waste end winding around the end of the apron and causing the buttons to tear and the apron to stretch. The Thompsonville plant has found that it's best to discard the apron when such damage occurs. To minimize this kind of accident, a suction pipe takes the waste end off.

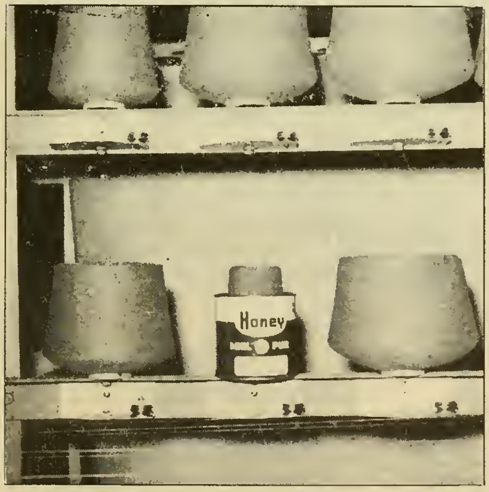
If the aprons are set too close, they will heat and swell. The Thompsonville plant uses a No. 24 card gauge to set the aprons; at this setting, they don't heat up and the roving gets enough rub to be handled by a spindle.

The setting is checked by looking at the roving on the spools. As the aprons wear, the setting is maintained. When the aprons wear down close to the canvas, they don't produce the same rub, and at this point, the aprons are replaced. A caution in replacing aprons is to tighten them enough to be taut but not enough to make the aprons wrinkle. It takes about five days to break in a new apron.

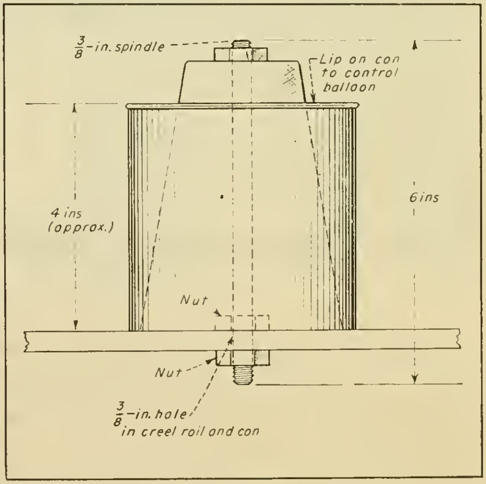
The aprons are washed right on the cards between color changes or about once a week (40-hr. week). A solution of Oakite and water is sprinkled on from an oil can with a spout, and stock is run through to clean off the aprons. This procedure, however, is recommended only with carpet stock.

Kinks and Short-Cuts

Tin-Can Balloon Control Helps Us Warp Fancy Yarns



TIN CANS stop fancy-yarn warping troubles. The balloon is better controlled, and production is more than doubled.



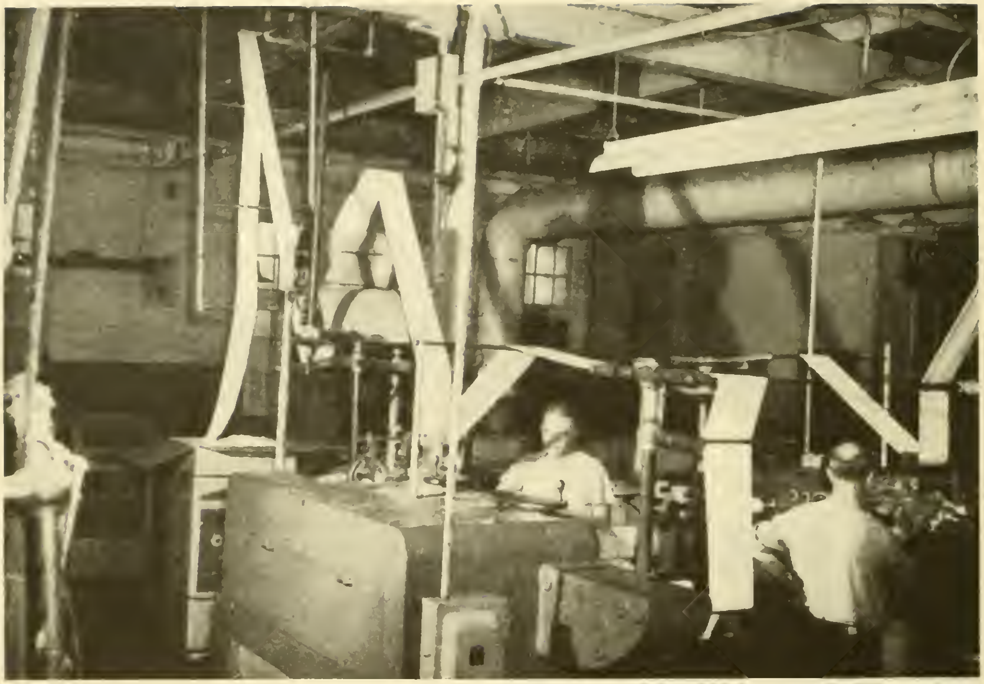
A SPINDLE and two nuts support the cone in the center of the can and hold the can on the creel.

We had considerable trouble when we made fancy warps containing splash, nub, hard-twist, and reverse-twist decorative yarns. The decorative yarns would snarl with the ground yarns when the warper was running because the yarn balloons would overlap in the creel.

I was able to cure this problem by controlling the balloon with a tin can set over the cone of decorative yarn as shown in the accompanying photo.

I used cans about 4 ins. tall and 4 ins. in diameter, with a lip around the upper edge of the can. I fixed the can to the creel rail with a $6\times\frac{3}{8}$-in. spindle by drilling a $\frac{3}{8}$-in. hole in the center of the can bottom and a corresponding hole in the creel rail. The spindle was threaded at one end, and the tin was kept tight on the creel with two nuts.

We can now run our warper at higher speeds with no trouble. Our production has doubled, and we get better warps. *A. Spivey, Huntingdon, Que.*



TOW TENSIONING is an elaborate arrangement designed to reveal breaks before they can cause trouble and to parallelize the filaments. Note Champlain's beater in first V the tow makes.

How Champlain Handles ORLON TOW

▶ Turbo Stapler at Champlain Spinners, Inc., breaks Orlon tow and reduces the denier to assist in making soft, cashmere-like yarns

▶ Mill-developed tensioning arrangement and other operating ideas assure successful Stapler operation

By JAMES H. KENNEDY, Managing Editor, TEXTILE WORLD

An integral part of the modified silk system of worsted-type-yarn manufacture at Champlain Spinners, Inc., Whitehall, N. Y., is the Turbo Stapler. The Stapler stretches and breaks tow to the long, variable fiber lengths required for the silk system, which features low twist, pin control, and low speeds for premium yarns.

Champlain is using the Stapler for Orlon tow to make the well-known Champlon yarns, which are difficult to distinguish from cashmere and are knitted into washable sweaters. Other kinds of tow besides Orlon may be processed at Champlain if the yarn market demands it.

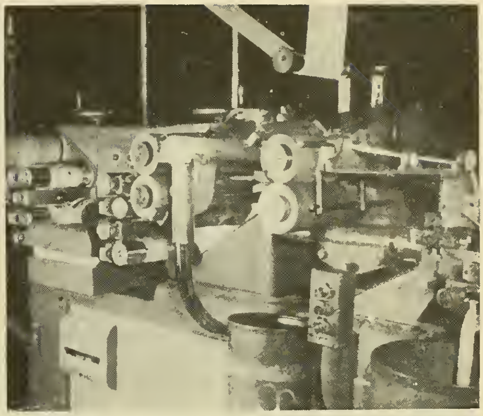
Champlain uses three Staplers, one of them having been in operation over a year. Each machine is fed about 330,000 total deniers of 2-den. Orlon tow. Delivery is about 50 lbs. per hr. of 1.75-den. sliver that weighs 2,200 grains per 20 yds.

Present production is only about 50% of theoretical machine efficiency, partly because defects in the tow require stopping the machine to get quality sliver without thick places.

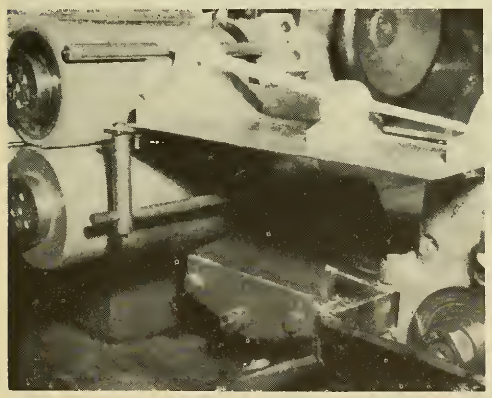
Mill-Made Tension Arrangement

Since tow feeding directly from the carton can't be used efficiently, a special tensioning arrangement is necessary. The strand passes through a ladder-type tensioning device over the carton and then is "fluffed" by a special eccentric beater designed at Champlain. This beater helps to separate the filaments and prevent breakage in the stretching zone of the Stapler.

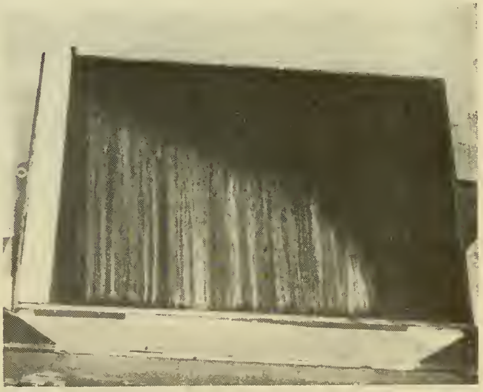
CHAMPLAIN'S BEATER (top) is an oval-shaped drum that revolves at high speed to fluff the tow by a rapid succession of sharp blows. The beater was designed by Champlain.



TURBO STAPLER at Champlain has rubber-and-Micarta roll combination. It stretches and breaks 50 lbs. per hr. of Orlon tow with 1.5% waste.



1-IN. PORCELAIN EYES (a Champlain idea) are set in wood and mounted on a sheet-metal plate between the breaking-zone delivery rolls and the crimper.



STAPLE ARRAY after processing on the Stapler with an 11-in. setting in the breaking zone looks like this. Maximum length is 11 ins. and minimum length is 3 ins. Denier went down from 2.0 to 1.36.

The rest of the guides over which the tow passes add tension and make the filaments parallel before they enter the Stapler.

The tow is gripped by three sets of rolls in the Stapler, and Champlain has standardized on rubber top rolls and Micarta bottom rolls. Pressure is set at No. 34 on the handwheel, which is equivalent to about 1,000 lbs. total nip pressure.

Tow first passes through an entering section with centering and width controls. Then comes the heated stretching section, with tensioning rolls before and after.

The draw ratio, or stretching draft, at Champlain is 1.58 and plate temperature is 280° F.

Denier is reduced from 2.0 to 1.36 in this section.

In the breaking zone, which comes next, Champlain has set the draft at 3.1 and the breaker bars to mesh $\frac{3}{16}$ ins. (No. 3 on the machine scale). This mesh setting varies with fiber strength, elasticity, and finish. The breaker bars are set 11 ins. from the front or delivery rolls to break fibers to an 11-in.-maximum and $3\frac{1}{2}$-in.-minimum length for Champlon. This setting can be estimated, but the exact setting is determined by trial and error to give the finished staple array desired.

Between the delivery rolls and the crimper, Champlain put in a set of three 1-in. porcelain eyes spaced 7 ins. apart. The guides are set in wood and mounted on a sheet-metal frame that fills the space between delivery rolls and crimper. The arrangement helps to return the flattened tow to sliver form in preparation for crimping.

The crimper is set to insert 18 to 20 crimps per inch. Wheel pressure is 200 lbs., and stuffing-box pressure is the minimum, O on the vernier adjusting wheel.

Stapler waste is removed once a shift and amounts to about 1.5%.

An open drawing, an intersecting gilling, three gill reducings, roving, and spinning follow the Stapler and constitute the modified silk system at Champlain.

BLENDING SILOS look like regular grain silos, but each silo is divided into 16 metal-lined vertical sections. Gross capacity of the nine silos is 270,000 lbs. of stock. Outside ducts carry stock to silo tops.

IS SILO BLENDING the Answer For Carpet Stock?

▶ In silo blending, carpet wool and rayon are deposited in silos that can hold up to 30,000 lbs. each. In effect, a huge blend is laid horizontally in the silo and then cut by dropping the stock from each of the 16 sections in each silo. Three silo processes are enough for a good blend.

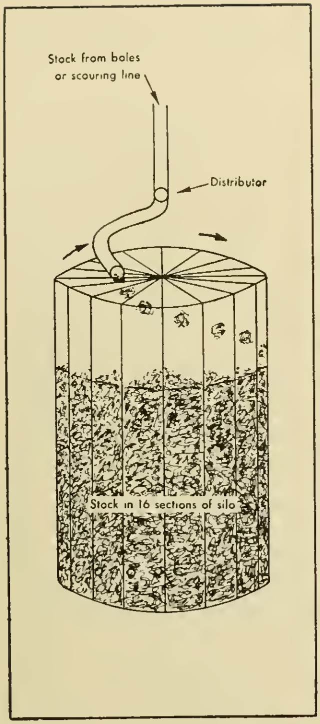
▶ Only one man and a helper run nine silos at Bigelow-Sanford. A central control panel is the heart of the system of ducts, photoelectric devices, and hydraulic systems.

By **GUSTAV ZELLNIK,** Consulting Editor, TEXTILE WORLD

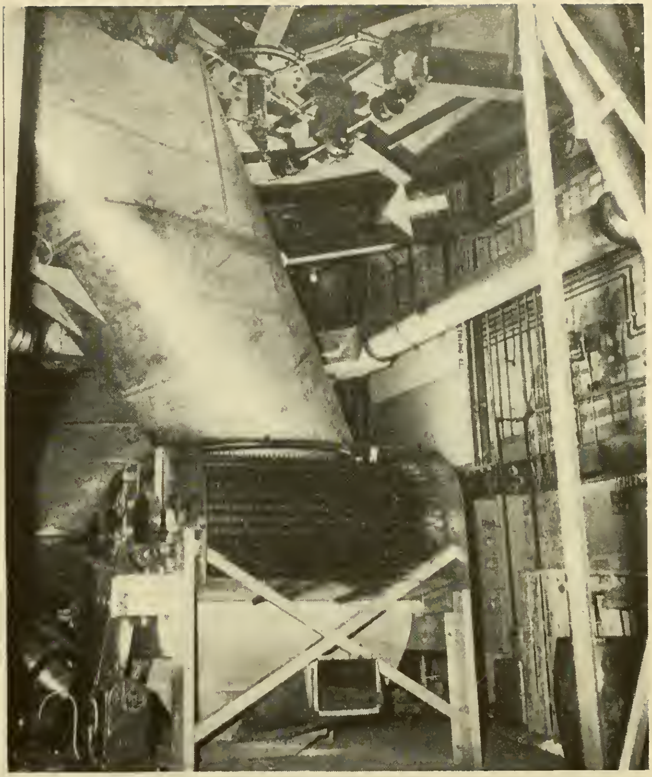
RAW STOCK FOR CARPETS is blended by the silo system at Bigelow-Sanford Carpet Co., Inc., Amsterdam, N. Y. The system, developed and patented by Bigelow-Sanford, is for large batches of stock. Here's how it works.

Each silo is divided into 16 pie-shaped, metal-lined vertical sections. A rotating distributor at the top divides any lot equally into the 16 sections. But each section is emptied separately, opened and picked slightly,

Thanks are given to Howard Dynes, yarn superintendent, and Jack Davis, project engineer, for their help in preparing this article.



BASIC IDEA of silo blending is to divide a batch of stock into the 16 sections by the rotation of the distributor. Each section is then dropped separately and sent up to the top of another silo to be divided again.



SILO BOTTOM looks like this. Entire plate revolves on casters (arrow). Section that opens to drop the blend is inside the duct, which rotates with the silo bottom. Opening-blending action is given by spiked rolls in unit at bottom.

and sent up as a new batch to another silo. Three silos are enough to produce a homogeneous blend.

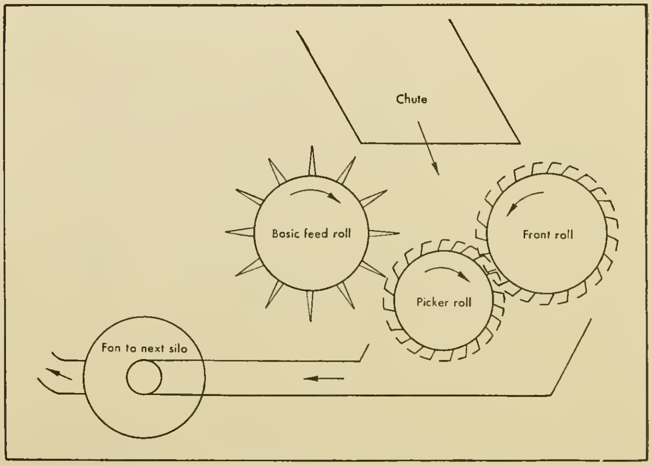
Bigelow-Sanford has three silo-blending lines of three silos each. Since each silo has a capacity of 30,000 lbs., total capacity is 270,000 lbs. of wool, rayon, waste, or whatever is being run.

Here's a Working Example

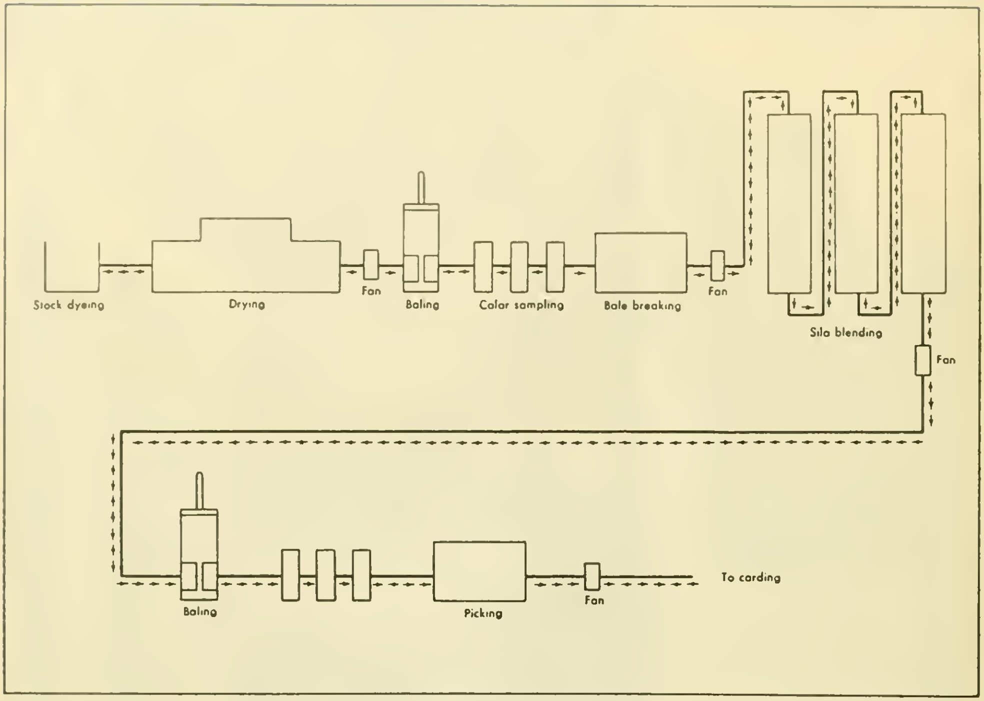
Let's start to blend four lots of 4,000 lbs. each. The first lot is distributed to the first silo; so there is 250 lbs. in each of the 16 sections. Now let's just consider one section.

After the other three lots are distributed, one section has four 250-lb. layers of unblended stock, a total of 1,000 lbs. Then this section is emptied from the bottom. In the second silo, this 250-lb. layer is divided into 16 sections again; so each layer is only about 15.6 lbs. When a section of this silo is sent to the third silo, each layer has about 1 lb. of stock.

In each case, each of the 16 sec-



FEED ROLLS under silo chute provide a picking action that aids the blending process. Underneath the rolls, stock is collected by the pickup hood and conveyed to the next silo or to a storage bin.



WHERE SILO BLENDING FITS IN. At Bigelow-Sanford, stock is baled after stock dyeing and drying. After color sampling, stock is opened on a bale breaker and sent to the silos. Blended stock is baled and then stored to await picking.

tions contained 1,000 lbs. of stock; but look at the difference in the number of layers in each section. At first there were four layers; then there were 64 in the second silo and 1,024 in the third silo. The blend from the third silo is practically homogeneous.

In addition to efficient blending and large capacity, the silo system features almost completely automatic control. One operator and one helper operate the entire system.

How the Silos Are Made

The nine silos stick up through a concrete building that supports them and houses the emptying and auxiliary equipment. The loaded silos are heavy; so the building was designed to take a load of 75 tons per silo. There are openings in the roof for three more silos, which, if installed, would increase gross capacity to 360,000 lbs.

Each silo is about 20 ft. in diameter and 65 ft. high. Ducts take the stock from the bale breaker, which is inside the building, out through the roof to the top of the silo. The distributor is under the silo roof, and there's a catwalk up there from which the operation of all silos can be checked.

A center post in the silo helps to support the 16 sections. The silo bottom is a circular steel plate that rides on casters and can be rotated. The plate has a droppable section, big enough to cover the bottom of one of the 16 sections.

A hydraulic piston indexes the droppable plate under successive sections. The drop plate is enclosed by a metal chute that delivers the stock to spiked rolls under each silo. These rolls empty the silo and provide a picking action that helps blending.

The stock falls from the spiked rolls into a metal duct powered by a fan that sends the stock to another silo or processing area. There are 150 switching points in the duct system.

Controlled From One Station

With the exception of the final delivery spout to the baling bin (which is positioned by the worker who patrols the system of catwalks on the top of the silos), the complete blending cycle is controlled by one operation from a central station.

The central panel board is a schematic duplicate of the actual duct system. The pipe lines and switches have the same relationship on the control panel that they do in the duct system; and at a glance, the operator can see the avenues of flow. Conveying pipes are shown on the panel by colored lines; and, in addition, pilot lights go on when the lines are in use.

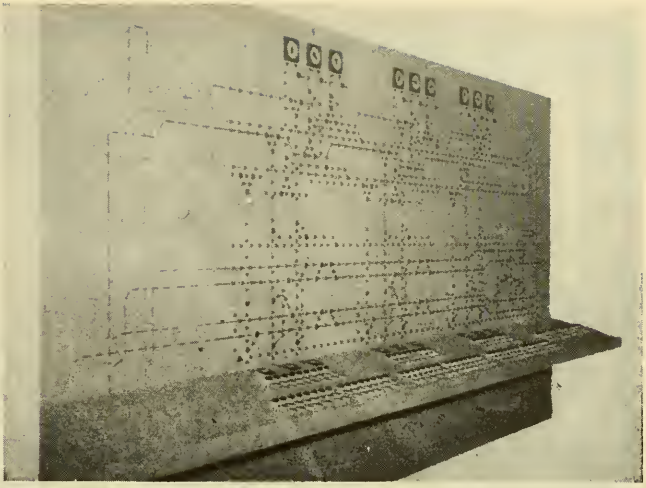
The color of the pilot light identifies a type of pipe line. Incoming lines from the bale breaker are green; outgoing lines to the storage bins are red; intersilo pipes (connecting silos in the same blending line) are orange for the *A* line, blue for the *B* line, and white for the C line; and interline pipes (connecting silos in different blending lines) are yellow.

The silo operator directs stock to any of the nine silos by setting up the correct pipe line; and a particular silo is used as the first, second, or third blending unit, depending on

the situation when it becomes empty. The interline pipes are used to transfer stock between blending lines for blending different types of stock.

When a batch is completed in one silo, the blending operation can begin immediately. There are two sets of incoming and outgoing duct lines.

When a selector switch on the control panel is turned on, the solenoid-controlled pneumatic system operates the actual switch in the duct system. When the duct switch completes its movement, a string of control-station lights goes on between that switch and the next switch in the line. If a mechanism is fouled or a line is plugged, the pilot lights do not light, and the operator knows that something is wrong. In addition, the lights clearly show the duct lines in use, and the operator can easily spot an error in the position of a selector switch.



MASTER CONTROL PANEL is a schematic duplication of the duct system. There are 150 duct switches and a string of pilot lights that don't burn if lines clog or if the switch doesn't work. Push buttons at the bottom control fans, feed rolls, distributor, etc.

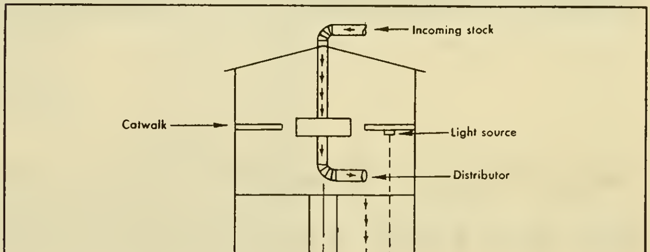
Silos Empty Automatically

When the first silo is full, the emptying cycle is set up on the board. The operator sets up the duct line with switches and then with push buttons, starts the distributor in the receiving silo and the conveying fan and the bottom feed rolls on the discharging silo, and drops the first section of stock. When the section is empty, a photoelectric circuit is completed; and the hydraulic system is energized to index the drop plate and chute under the next section. This action continues until all 16 sections are emptied.

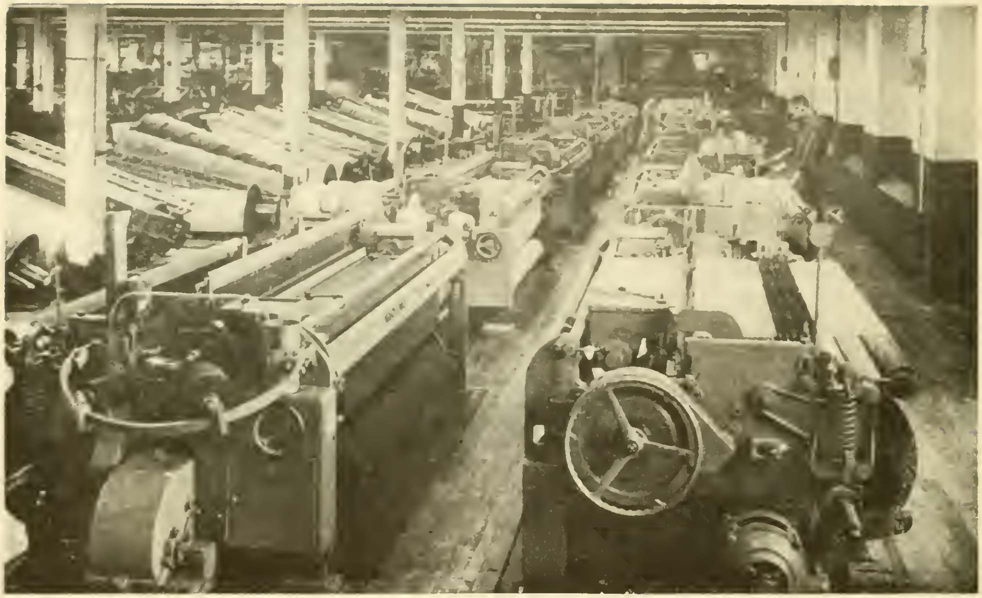
When the chute is indexed back to the first section, automatic switches shut down the photoelectric and hydraulic equipment and close the drop plate. At the same time, a time-delay relay is energized to shut down the fans and related equipment after all stock has had time to clear the duct line.

The panel shows the production rate (in pounds per hour) of each silo as relayed from a tachometer generator on the feed rolls. In addition, the operator can check the position of each bottom plate and tell how many sections are empty.

A local control station, duplicating the control feature of the panel, is mounted under each silo, along with an additional control that enables the operator to vary the production rate of each silo independently. Because of the size of the installation, rapid communications and action are necessary; so an intercom system was installed and master disconnect switches for the whole operation were placed in three locations. For easy and safe maintenance, power can be removed from any single unit through separate disconnect centers.

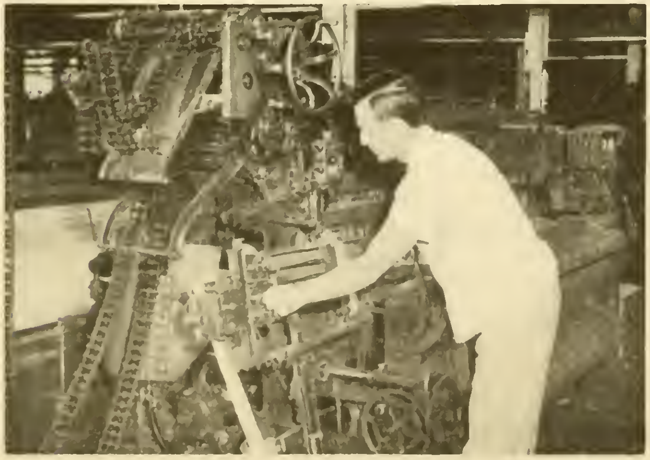


SILO DETAILS show how photoelectric system works to automatically move circular bottom to empty the next section. Only the silo bottom and below are inside the building.



WOMEN'S APPAREL is being woven on Warner & Swasey weaving machines at the rate of 100 yds. per machine each 8 hrs. Machine Fixer Paul Luffman and Weaver Edward Atkins tend the 12 machines.

Supervisors Constantly Follow Up WEAVING OPERATIONS at Chatham



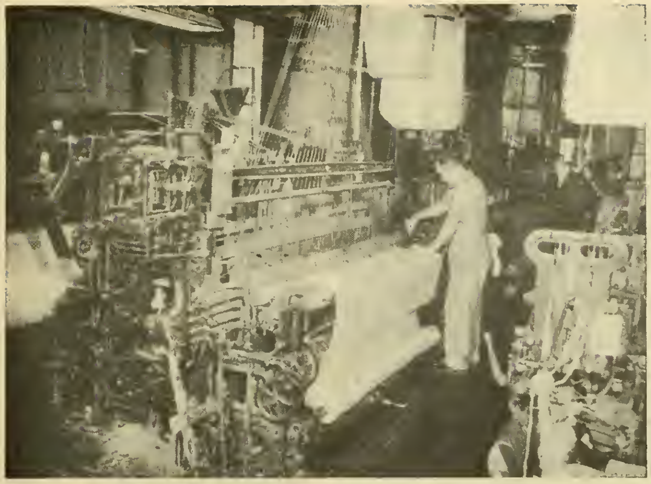
PLAID BLANKET in wool-and-synthetic-fiber blend is made on a 92-in. W-3 loom with Knowles head motion. Weaver Fred Stanley restarts a loom after a filling break. Filling is mixed on the body weave.

Chatham Mfg. Co., Elkin, N. C., has three features that keep it in top weaving condition—

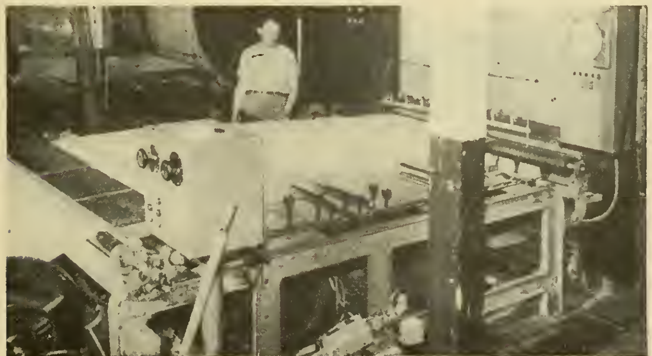
- Diversified equipment to weave any type of woolen cloth
- Constantly trained fixers to keep the equipment operating
- On-the-job follow-up by supervisors

By RICHARD B. PRESSLEY
Associate Editor, TEXTILE WORLD

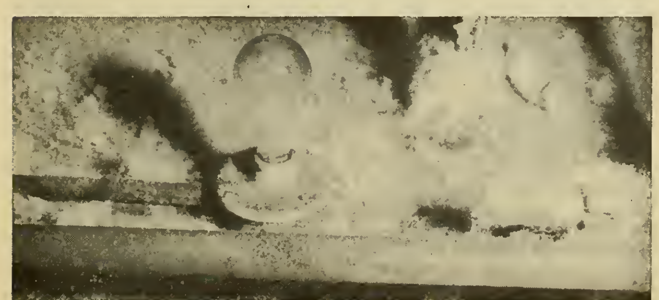
LOOMS AND WEAVING MACHINES are turning out woolen, cotton, and synthetic-fiber blankets at Chatham's Elkin plant. The mill also weaves women's apparel in woolens and worsteds and automobile-upholstery



ELECTRIC BLANKET is woven with both jacquards and dobbies on the same loom. The dobby puts in the twill body weave, and the jacquard weaves the channels for the wiring. Loomfixer Harvey Wooten makes an adjustment.



SLASHING is necessary on blended materials containing a high percentage of cotton fibers. Harvey Cook, slasher tender, spends most of his time inspecting yarns on the Bachmann Uxbridge hot-air slasher.



CLOTH INSPECTION at the loom is made easy by two 150-w. light bulbs underneath the loom. Energy comes from a transformer that cuts the 220-v. loom-motor line down to 110 v. The lint doesn't catch on fire.

fabrics in wools, worsteds, and synthetic fibers.

Equipment Is Varied

There are 416 Crompton & Knowles looms and 12 Warner & Swasey weaving machines in the plant. The looms vary in width from 92 to 120 ins. The weaving machines are 95 ins. wide.

Jacquard attachments are used on 78 of the 92-in. looms, and some of the looms equipped with jacquards also have dobbies. The jacquard-and-dobby-equipped looms are used primarily to weave electric blankets. The dobbies weave the plain part of the blankets, and the jacquards weave the channels for the wiring. The loom speed of all the jacquard-equipped looms is 108 ppm.

Other C&K looms (W-3) are equipped with Knowles head motions and are used to weave blankets, automobile-upholstery fabrics, and other materials. Speeds on these looms are: 92-in. looms, 122 ppm.; 106-in. looms, 112 ppm.; and 120-in. looms, 106 ppm.

The weaving machines operate at 230 ppm. and are used to weave patterns with single filling colors.

Loomfixer Training Is Constant

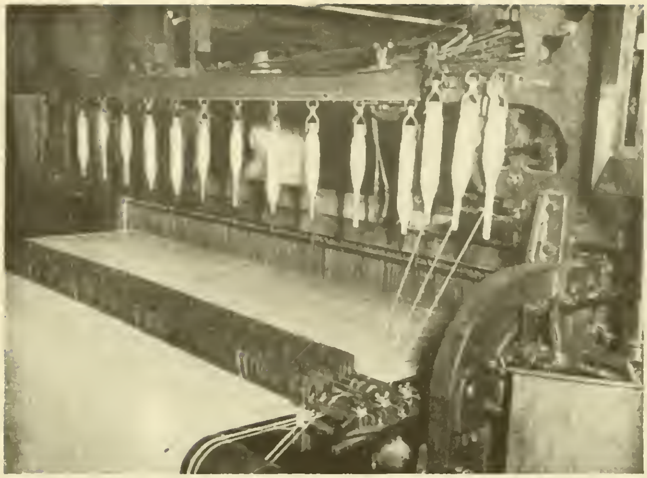
Keeping looms in good mechanical condition is the key to Chatham's successful weaving operations. Constant training of loomfixers makes it possible to keep the looms running at a high efficiency figure.

Loomfixers now on the job were trained by Loomfixer Instructor G. R. Hall. Most of the present loomfixers were weavers and were trained in special classes on looms out of production. The training included tearing down loom motions, putting the motions back together, and resetting them.

Another phase of developing loomfixers in the classes included tearing down 110-in. looms and rebuilding them as 92-in. looms.

All looms at Chatham are set to standards approved by Mr. Hall and the superintendent of weaving, N. C. Darnell. All looms on the same style of cloth are set exactly alike. Each loomfixer can experiment with one loom on his section to try to establish better settings; but in each case, he notifies the loomfixer instructor so that the other two loomfixers on the other shifts of the same section will know how the loom is set.

A company-sponsored dinner meeting is held for loomfixers, head loomfixers, and weave-room supervisors once each month. The meeting is held during work hours, and employees at work at that time leave their jobs on company time.



PIECING ENDS hang from shuttle grips fastened by rings held to the back loom arch by capscrews. A "yo-yo," the name given a filling separator that prevents jerk-backs, is formed by three bobbins on the right. The threads are lifted by the head motion, and the take-up roller pulls them off to prevent breaks from chafing.

Any proposed changes in loom settings are discussed at the meeting. Everyone present can give his opinion. Then any decision reached on any loom-setting change is put into effect immediately. As a result, every loomfixer knows how every loom should be set, and every loom is kept set that way until the next meeting when new changes are discussed.

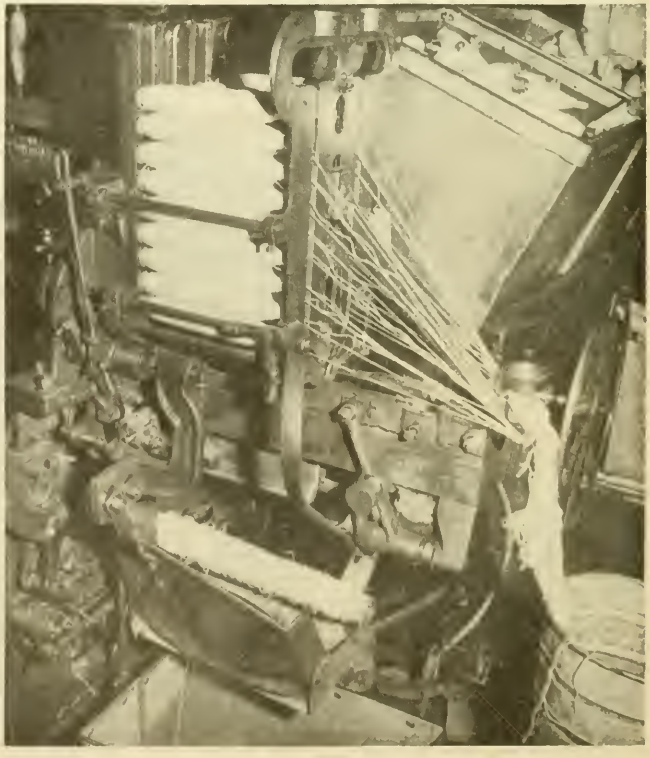
Reports Show Progress

Loom-stop reports are made on all stopped looms that weavers cannot restart. Each weaver is given a loom-stop report sheet at the beginning of each shift. When a loom is flagged for a loomfixer, a warp break-out occurs, or a warp runs out, the weaver records the time the loom is out of production.

The report is taken up at the end of the shift and checked by the head loomfixer on the following shift. If a loom has been flagged three or four times for, say, running out filling, the head loomfixer checks with the loomfixer and helps find the trouble.

All reports are turned in to the weave-room office, where they're processed to show the exact number of loom stops, other than normal weaver's stops, each week. The reports also show the total hours lost from looms out of fix, warps out, etc.

Then the superintendent of weaving and the loomfixer instructor know what's causing any trouble; and they, along with weave-room foremen and assistant foremen, correct the trouble.



QUILL STRIPS are removed automatically by the loom-driven bobbin. The ends of transferred quills wind around the bobbin and eliminate the need of further cleaning. Quill boys wind off the few ends that remain on the quills.

Daily-production and second-quality-cloth reports are kept to show how each style of cloth, each section of looms, and each weaver's set of looms compares with others. The loomfixer instructor can quickly spot the trouble and correct it when a style of cloth or a set of looms is running bad.

Weekly production and quality sheets are posted in the weave room by sets and sections of looms.

Fabrics Vary Greatly

All types of blankets are woven at Chatham. The blankets are all-cotton, cotton and wool, all-wool, wool-and-synthetic-fiber blends, and synthetic-fiber blends.

Automobile-upholstery fabrics are woven from wool and worsted yarns, wool and nylon, wool and rayon, and all-synthetic-fiber blends in nylon, rayon, acetate, Orlon, etc. Many of the woven materials are in bold checks or stripes. Dope-dyed-acetate filling decoration yarns are often used.

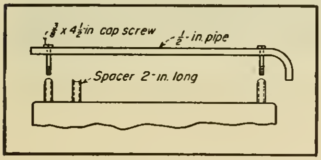
Typical upholstery fabrics made of woolen-system yarns are 83% wool and 17% staple nylon; 62% wool, 16% cotton, and 22% nylon; and 20% nylon and 80% viscose. Typical upholstery fabrics made of worsted-system yarns are 20% nylon, 52.5% cotton, and 27.5% viscose; and 71.4% viscose, 18.4% nylon, and 10.2% acetate.

That's just a small sample of the variety of upholstery materials being run on looms side by side with the large variety of blankets and women's wearing apparel.

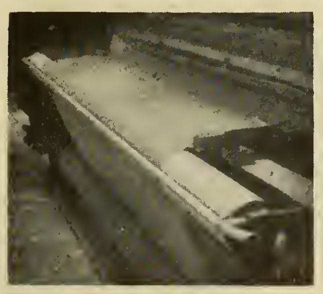
Even with the large number of styles, Chatham keeps the looms in good mechanical condition and set right to keep the weave room rocking along at high efficiency and banging out high-quality fabrics.

Kinks AND SHORT-CUTS

We Use a Pipe To Protect Our Loom Take-Up Rolls



THE ½-IN. WATER PIPE is long enough to reach across the take-up roll. Two ½-in. diameter holes are bored in each end for cap screws that hold the pipe to the take-up roll stand. The pipe is bent on the drive end of the loom. Two spacers, 2 in. long, are ground on one end to fit the pipe.



PIPE IS FASTENED to the take-up stand with a 4½-in. cap screw. The spacer is between the pipe and the take-up-roll bearing cap. Notice the bent end to prevent accidents at the drive end of the loom.

Part of our W-3 looms face an open spare floor. Filling, warp, and cloth trucks used to run into the take-up rolls and damage both roll and fabric.

We made a protector to prevent further damage.

A long piece of 1-in. water pipe was used to make the protector. Two pieces of the same-size pipe were cut 2-in. long to be used as spacers. The spacers were ground on one end to fit the contour of the protector pipe.

The spacers were ground before they were cut because the longer pipe was easier to hold against the grinding wheel than the 2-in. pieces.

The long pipe used for the protector pipe was bent on the drive end of the loom to prevent a sharp end from sticking out. One $\frac{7}{16}$-in. hole was bored in each end of the protector pipe to fasten the rod to the loom.

The two top cap screws were removed from the take-up-roll bearing cap; the protector pipe was placed against the bearing cap; and a $4\frac{1}{2}$-in.x$\frac{3}{8}$-in. cap screw was placed through the protector pipe, the spacer, and into the bearing. The cap screws were tightened securely with a wrench.

We placed these protector pipes on all our W-3 looms and do not have any more cut cloth or damaged take-up rolls. Wilfrid Belair, Lachute, P. Q.

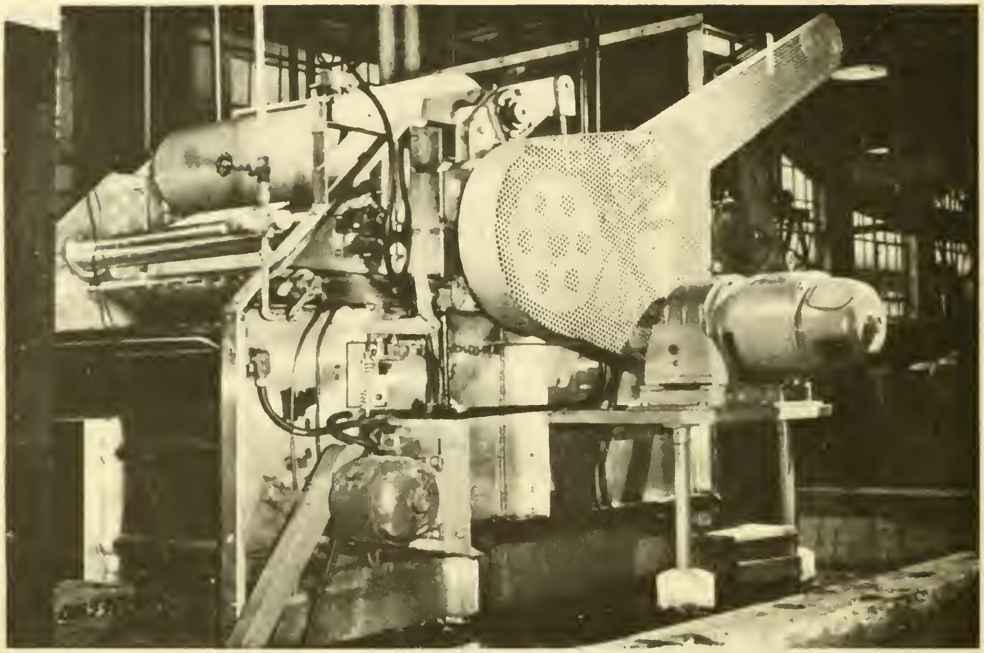
Gill-Box Guard Covers Danger Spots

NO MASHED FINGERS HERE! Gill-box guard, made of round bar stock, is hinged at one end; but it's hard to run the machine unless the guard is in place.

Over a period of years we've had some serious accidents caused by operators getting their hands caught in the fallers of our gill boxes.

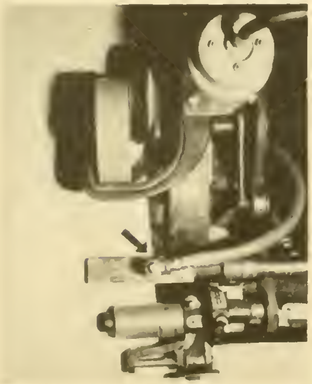
Now our accident rate on gill boxes is 'way down. We built a guard to cover the danger spots. We took some round $\frac{7}{16}$-in. cold-rolled stock, cut it a little wider than the fallers, and welded the rods about $\frac{3}{4}$ in. apart from front to back. Eyes for $\frac{3}{8}$-in. cap screws are welded at the end to act as a hinge.

A foolproof feature of the guard is this: It is not very easy for the operator to run the machine unless the guard is in the proper position.



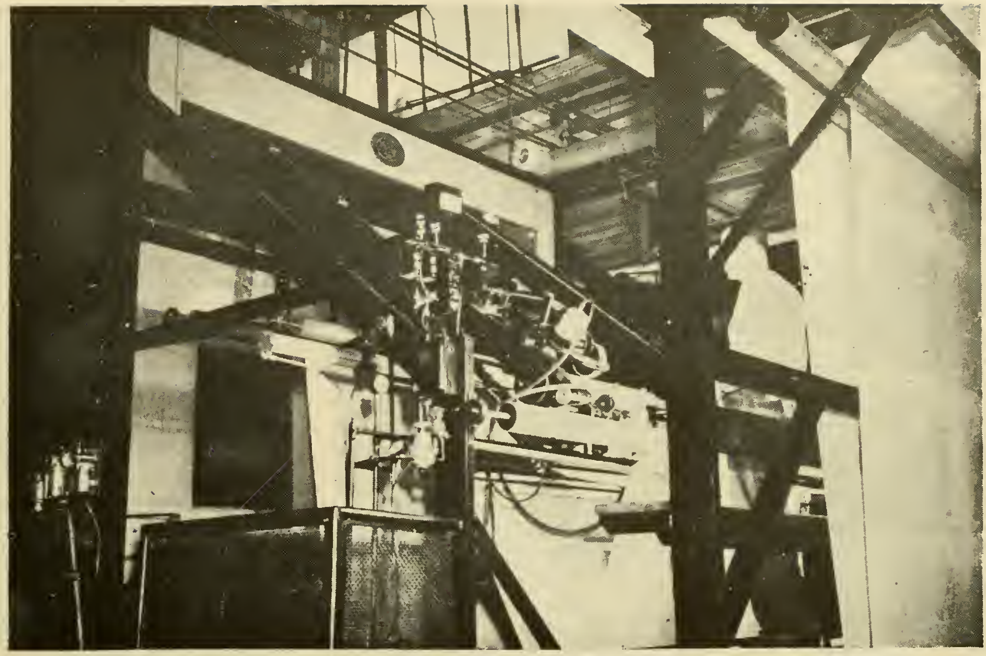
DELIVERY END of the Riggs & Lombard continuous washer delivers cloth at 45 yds. per min. Each of the nine bowls is driven individually from the large motor, and a small motor operates the liquid counterflow from bowl to bowl.

Chatham's Modernized



HYDRAULICALLY OPERATED DEVICE is used to control tenter-frame width. The cloth passes over an orifice (arrow) that expells air at 5 psi. Any movement of the cloth from side to side upsets the equilibrium and causes the feed-adjusting arms of the tenter frame to move in or out with the cloth.

CLOTH IS BOILED instead of crabbed. In this machine, the covered cloth is immersed in boiling water and steam is blown through the center of the roll for 20 to 30 mins. The finish becomes well set, and the fabric assumes luster.



CRIB-BLANKET FABRIC enters the tenter frame to be conveyed through the dryer. The addition of this dryer increased total dryer production 25%. Steam furnishes the heat for the oven.

FINISHING PLANT

Present finishing equipment at Chatham Mfg. Co. is radically different from machinery used five years ago. Seconds are down 25%. New machines contributing to higher production and quality are—

- **A continuous washing range**
- **A carbonizing range with a continuous crusher**
- **Automatic controls**
- **Piece-dyeing equipment**

By **MICHAEL LONDON,** Assistant Editor, TEXTILE WORLD

Chatham Mfg. Co., Elkin, N. C., now has a finishing department with equipment radically different from the machinery present five years ago. Estimated seconds are down 25% from those produced by the older machines.

Average production of the finishing plant is from 60,000 to 70,000 lbs. of finished fabric per day. Products include blankets, suitings, and automobile-upholstery fabrics.

Although wool is the major fiber being processed, Chatham also uses cotton and synthetic fibers, alone and in blends.

Cloth Carbonized Twice as Fast

Three years ago a new continuous carbonizing range was installed. This unit doubles the production of the machine it replaced.

A wetting-out operation, an acid bath, a tenter dryer, a baker, and a continuous crusher comprise the carbonizing operations.

In the stainless-steel acid tank, the concentration of H_2SO_4 is automatically regulated by a pH meter. This device controls a pump that feeds sulfuric acid to the tank.

The tenter frame on the carbonizing range is equipped with a Reeves variable-drive overfeed, and the cloth is conveyed through a tenter dryer containing two temperature controls. Yardage of cloth entering the dryer is automatically recorded on a tape.

Through the baking unit, the cloth travels up and down over rollers. Three temperature controls used in this unit assure even heating of the fabric. Both the dryer and the baker are heated by circulating hot air.

When the cloth reaches the crushing operation, its speed is approxi-

mately doubled and it travels back and forth through two sets of crushers. Slightly longer time of forward motion results in a delivery of 20 yds. of crushed cloth per minute.

The unit has been found to improve the appearance of piece goods by contributing to even dyeing and eliminating end-to-end shading.

Fulling Mills Modernized

Performing the fulling operations are 10 fulling mills, with one man operating three machines. Seven machines are wood lined and three stainless steel throughout. Eventually the wood-lined mills will be replaced by stainless-steel models.

The stainless-steel fulling mills are equipped with rubber rolls. In general, stock-dyed material is processed in the wooden machines. White goods to be piece dyed are run in the stainless-steel mills.

Included in the washing equipment is a Riggs & Lombard nine-bowl stainless-steel continuous washer that works on the counterflow principle. This washer uses the first bowl for the scouring solution. Each bowl is equipped with an individual drive and an individual pump that operates the counterflow of liquid from bowl to bowl.

The unit has an automatic water control. If the machine is stopped, the water level remains constant. The machine washes fabric at about 45 yds. per min.

There are two scutchers for use after washing.

Drying Production Upped 25%

In addition to the dryer in the carbonizing range, there are four other tenter dryers used to dry cloth after washing or piece dyeing. These dryers operate like the unit used in the carbonizing range, and all but one of the dryers employ overfeed mechanisms.

One of the dryers is also used for rubberizing fabrics. In being rubberized, the cloth is lowered to contact a roll that revolves in a pan of rubberizing solution. A doctor blade removes the excess material from the fabric as it enters the tenter dryer.

On one of the Hunter dryers, the side-to-side motion of the start of the tenter frame is hydraulically controlled. Each side of the cloth runs partly over an orifice that expels air at about 5 psi. As long as the cloth covers half the orifice, there is no movement of the frame in and out. If the cloth widens and the orifice is completely covered, the tenter spreads out to re-establish the equilibrium. If the cloth narrows, the increase in air flow causes the tenter to narrow.

Chatham has ordered these controls for all its other tenter frames.

Stainless-Steel Dyebecks

The piece-dyeing equipment consists of 26 Riggs & Lombard stainless-steel dyebecks. There are 23 six-string machines and three 12-string units. One man operates three or four machines, depending on the dyeing cycle. Total production of these becks is 550 pieces 70 to 75 yds. long every 24 hrs.

Direct dyes are used for cottons, acid dyes for all-wools, and acetate dyes for blends containing synthetic fibers.

Temperature and the rate of temperature rise and fall are controlled automatically by a Foxboro Cyclelog.

Fabrics are also peroxide bleached in these units. Bleaching time is 4½ hrs., and the total running time for bleached goods is 6 hrs.

Instead of crabbing, a boiling operation is given to some fabrics, suitings for the most part. The fabric, rolled and covered, is immersed in boiling water; and steam is forced through the inside of the perforated roll from 20 to 30 mins.

Napping Equipment Modernized

The napping department, employing about 85 people on three shifts, has also installed modern machines. New double-acting nappers have increased production 10 to 15%, and the quality of the napped blankets has also been improved.

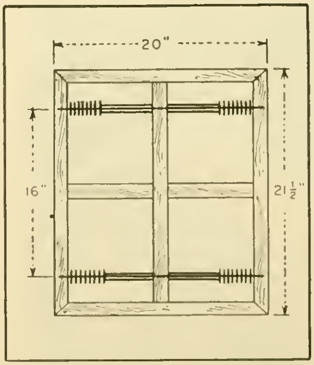
Napping equipment consists of 28 Woonsocket nappers, 8 Davis & Furber nappers, and 1 teaseling gig. Of the nappers, about one-fourth are single acting and the remainder double acting.

Big Worsted-Roving Cans Have Harness-Chain Wheels

A short time ago we increased the size of our gill-box cans to 20x20¼x 41½ in. The new cans, made of fiber board, hold about 22 lb. of stock, and our operators found that moving them around was a hard job.

We made rollers for the cans from harness-chain bars. The bars, cut 18 in. long for us, ride in holes we drilled on 16-in. centers in the bottom support along the longer side. There are eight rollers at each of the four corners—kept out at the ends of the bars with lengths of ⅜-in. pipe.

Now the operators move the cans around with ease. The rollers lift the can only 1/32 in., so dirt is pushed ahead and does not clog the rollers. *Charles Gillooly, Providence, R. I.*



EIGHT ROLLERS at each corner lift this gill-box fiber-board roving can about 1/32 in. off the floor to make for easier handling.

Medium Wool and Shoddy Need 4-to-1 Water to Oil

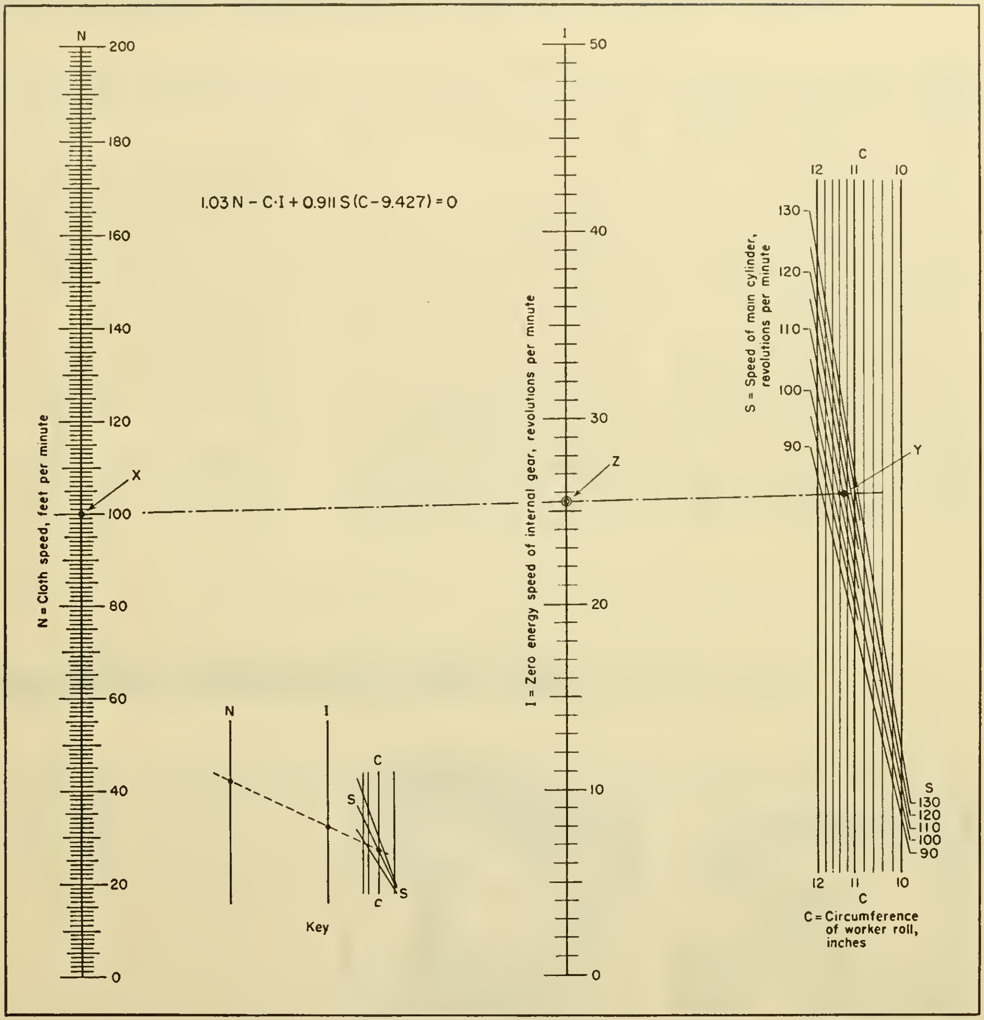
Technical Editor:

What percentages of oil and water are best for these blends of wool: (1) 75% medium wool, 25% worsted picked shoddy; (2) 60% Texas wool, 40% worsted noils; (3) 50% coarse 40s wool, 35% worsted picked shoddy, 15% garnetted nylon? (9779)

For Blends 1 and 2, use water to oil in a 4-to-1 ratio. Put on about 16% emulsion by the weight of stock.

In Blend 3, the nylon doesn't take the oil; so give the 40s wool and the shoddy three pickings with about 12% emulsion, mixed water to oil in a 6-to-1 ratio.

Zero-Energy Napper Speed Determined by Nomogram



INTERNAL-GEAR SPEED for zero energy is determined this way. On left scale locate cloth speed—100 ft. per min. in this example. On right scales, locate point where worker-roll circumference (vertical lines) crosses main-cylinder speed (slanted lines). In the example, the worker roll measures 11.3 ins. with new clothing. Cylinder speed for the 80-in., 24-roll napper is 110 rpm. Join the two points you've located, and read where the line crosses the center scale. Internal-gear speed for zero energy is 25.7 rpm. in this case.

To get maximum napper production, you've got to know the zero-energy point. Ordinarily this figure must be calculated, and the mathematics are not too simple.

That's where this nomogram developed for David Gessner Co. comes in. All you have to know is cloth speed, worker-roll circumference, and cylinder speed. Here's how it works.

On the left scale, locate cloth speed (feet per minute). This is point *X*.

On the right scales, locate the point where worker-roll circumference (inches) intersects main-cylinder speed (revolutions per minute). This is point *Y*.

Join *X* and *Y*, and the point where this line crosses the middle scale is point *Z*. *Z* is the zero-energy speed of the internal gear (revolutions per minute).

In case you're interested, the nomogram is based on this formula:

$$1.03(N) - (C)(I) + 0.911\,S\,(C - 9.427) = O$$

where *N* is cloth speed (ft. per min.)

C is worker-roll circumference (ins.)

S is main-cylinder speed (rpm.)

I is zero-energy speed of internal gear (rpm.)

With the nomogram, a wide range of fabrics can be accurately napped by less-skilled operators. *Douglas P. Adams, Massachusetts Institute of Technology*

Nine Causes of SHUTTLE WEAR—

▶ **Most shuttle wear comes from neglect of lay parts and the misalignment that follows. This wear can be greatly reduced by following good loomfixing practices.**

Shuttles operate under many conditions, and each condition constantly changes during the life of a shuttle. These changes, no matter how slight, affect shuttle life.

This type of shuttle wear is normal and is therefore unavoidable. This normal wear starts when the binders, pickers, checkstraps, box plates, leathers, etc. pass from a new condition to a sufficiently worn condition to require replacement.

Based on a talk given by J. M. Tuten, Draper Corp., at a recent meeting of the Southern Textile Association at Ware Shoals, S. C.

Why Do Shuttles Wear?

The more-common causes of shuttle wear are perhaps the most serious. They can be divided into two broad classes:

1. Internal wear
2. External wear

The internal wear is caused by allowing the hardware in the shuttle to become loose. This condition usually occurs when there is no system for periodically checking shuttle screws. A shuttle spring or eye that is allowed to run loose for even a short period of time usually makes the shuttle unfit for further satisfactory service.

To correct this problem, establish a system to check each shuttle for loose hardware at specific intervals.

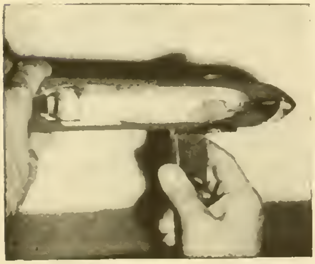
External wear is more serious and is generally caused by crooked shuttle flight. It is also caused when the shuttle meets some object in its flight. Crooked shuttle flight can be the result of a number of things, such as:

1. An improperly positioned front box plate
2. Back box plate out of alignment with the reed
3. Reed bowed, or out of square
4. Sharp dents in the reed. (To check a sharp reed, rub your thumbnail across the reed; if it is marked, the reed is sharp enough to wear the shuttle unnecessarily.)
5. Lay warped
6. Offset shuttles or pickers
7. Improperly set picker
8. Shuttle wider than the lay section
9. Too much picker-stick power

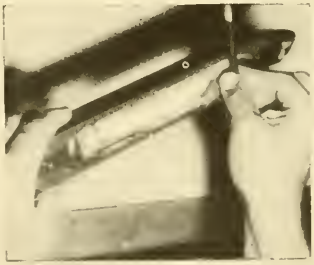
Correct Shuttle Wear This Way

All these faults can be corrected with a little effort. Following the instructions furnished by the loom man-

Put New Shuttles in Right

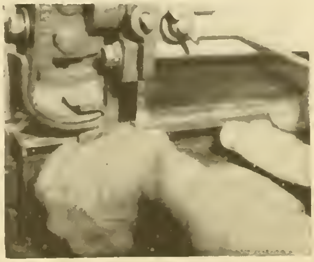


GAUGED SHUTTLES assure positive boxing in both ends of the loom.



TRUED GRIPS let the filling pass off the bobbin evenly.

EQUALIZED PAD TENSION means fewer filling breaks at knots.



ALIGNED REED prevents wearing out shuttles at the back surface.

▶ **If you are using too many shuttles, check your methods for putting in new shuttles. Perhaps your shuttles wear out because they're put in wrong. This checklist will cut your shuttle costs.**

By W. R. CALLAWAY

To obtain good results in weaving efficiency and cloth quality, new shuttles must be put in the loom correctly. Then, for the first few days after installation, the shuttles must be checked periodically to be sure they aren't being damaged.

An incorrect installation of new shuttles is indicated by shuttles scarred from a badly aligned lay. Filling also breaks excessively, and the result is usually second-quality cloth containing broken picks.

The accompanying checklist is for S-6 looms, but with minor changes it can be used just as effectively on other Crompton & Knowles looms. All bobbin-changing looms will be particularly improved.

Fabrics woven on Draper looms will

and How To Remedy Them

ufacturer to show proper settings for shuttle boxes and reeds in relation to back box plates will eliminate most unnecessary wear.

The shuttle box is the only thing that can influence the shuttle and its relation to the reed during shuttle flight. Any misalignment given the shuttle as it leaves the shuttle box is greatly magnified by the time it reaches the opposite box.

Keep all box plates covered with leather to protect the shuttle; and set back box plates exactly in line with each other with a long straightedge.

Avoid excessive heel spring; use just enough spring to prevent excessive parallel-shoe kick back. If too much heel spring is used, the checkstrap must be adjusted tighter than necessary; and shorter checkstrap life results.

Use sufficient picker-stick power at all times to guarantee the arrival of the shuttle ahead of the shuttle feeler before a filling transfer. If the shuttle is late, the shuttle will be marked. This marking is evidenced by rapid chewing up of the shuttle as it enters the left-hand box.

Since the shuttle rises when it boxes, set the Stafford thread cutter high in the thread-cutter hole in the shuttle rather than low. A low setting will often chip or mark the bottom of the hole. This interference will often cause the knife to miss the filling and may result in jerk-backs.

Here Are Some Do's and Don'ts

Check lays for levelness with a long lay gauge and the lay-height gauge. Don't ever guess at lay settings. Correct any lay settings that don't conform to the gauges.

Check lays for levelness with a long straightedge. A high lay cuts seriously into the life of a shuttle. A long straightedge will also show such things as twisted lays resulting from untrue lay swords.

Keep the bottom warp shed no higher than ⅛ in. off the race plate when the lay is at the back-center position. A high bottom shed will reduce shuttle life considerably.

Two loomfixing practices that will cut into shuttle life are:

1. Scraping the backs of new shuttles. The protective coating on new shuttles is very durable and helps protect shuttles until it wears off. Scraping the coating off the back of a new shuttle reduces the life of the shuttle by 8 to 10 days.

2. Putting in new shuttles without first aligning the lays. If a lay isn't aligned properly when a new shuttle is put in a loom, the new shuttle will soon be in the same condition as the old one.

To REDUCE SHUTTLE WEAR

A CHECKLIST FOR LONGER SHUTTLE LIFE

Check the Shuttle

☐ 1. Use a shuttle gauge to match the shuttles so that they are the same size. Then they will box correctly in the magazine end of the loom.

☐ 2. Align the bobbin grips to hold the bobbins straight and level. Tighten all screws.

☐ 3. Polish the shuttle eye with crocus cloth. Be sure the eye is the correct kind for the filling being run. Adjust the tension on the eye pads equally, and set the tension for the filling.

☐ 4. Be sure the fur is the correct grade for the filling and in good condition. Trim the fur.

Check the Loom

☐ 1. Align, time, and divide the shuttle box on the drop-box end of the loom. Align the box plate on the magazine end of the loom. Align the reed at the bottom and top on both ends of the lay.

☐ 2. Position the shuttles in the shuttle boxes. Set the box front and binder on the magazine end so that the box front will not be more than 1/8 in. from the outside shuttle wall at the mouth of the box. At the same time, set the binder and box front so that the point of the shuttle will be in the center of the slot for the picker in the lay end.

☐ 3. Set the picker-stick stop so that, with the shuttle all the way in the shuttle box, not more than two rings of the bobbin in the shuttle show beyond the division block of the magazine.

☐ 4. Set the box top 1/32 in. over the back wall of the shuttle.

☐ 5. Parallel the pickers at the back and front on both ends of the loom.

☐ 6. Examine both picker-stick stops for wear.

☐ 7. Check the picking motions on both ends of the loom. (Good loomfixing practice requires that the lug straps be set as high as possible. Lug straps can usually be raised after new shuttles are put in the loom).

☐ 8. Set and time the harnesses. Be sure the top shed is 1/4 in. over the shuttle when the lay is at the back-center position.

☐ 9. Reset the binders and checkstraps on both ends of the loom so that the shuttles will box correctly.

Before a new set of shuttles is put in a loom, have the loomfixer check the shuttles and the loom.

also be improved if a similar checklist is used when new shuttles are put in the loom.

The greatest asset from properly installed shuttles is, of course, longer-lasting shuttles.

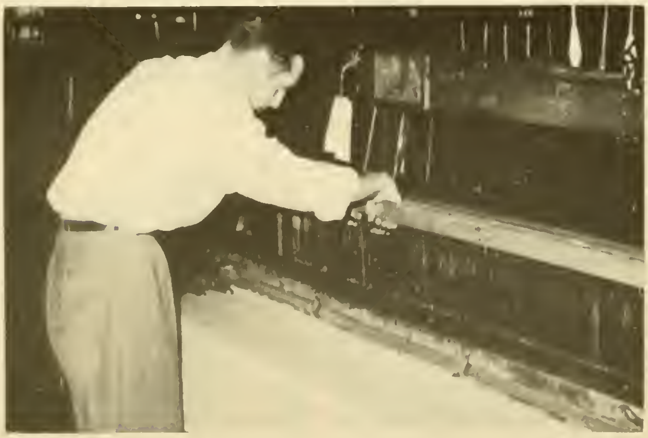
Tips for Slashing and Weaving

▶ To weave fine gabardines from wool-synthetics blends—

- Slash warps with great care
- Align loom beams
- Campaign against oil and grease stains

By **EUGENE P. SCHREMP,** Consulting Editor, TEXTILE WORLD

LOOM-BEAM FLANGES should be tightened and aligned before beams are put in the slasher, to prevent uneven cloth.



BUNCHED-UP HEDDLES should be corrected by setting the tension on harness ribs as soon as a warp is tied on.

Fine worsted gabardines ordinarily require moderate attention in slashing and weaving; but when some of the newer synthetics are blended with wool for such fabrics, certain points deserve increased attention. Here are some thoughts you should keep in mind.

Slash Warps Correctly

Slashing is one of the most important operations if worsted-synthetics blends are to be woven successfully. Poorly slashed warps cause trouble that results in low weaving efficiency and fabric imperfections.

In preparing the size mixture, the amounts of water and size should be uniform from mix to mix. The size temperature and cooking time should also be uniform.

After a proper procedure has been set up, daily reports should be kept so that the amount of size used for each warp set can be determined.

Best results are obtained if the slasher is run on a three-shift basis. Stopping a slasher each day invites trouble, and labor costs are increased because considerable time is lost in washing out lines. Size is also wasted, because it is often not practical to keep size from one day to the next. One of the most serious troubles encountered in stopping slashers for one or more shifts is formation of hard size that causes warp smashes in weaving.

Good results are obtained when fine single yarns are slashed on a hot-air slasher set up for a double dip. The yarn runs through part of the dryer and then back through the size box for a second dip. With this method, size pickup is high.

Another way to increase the effectiveness of the slashing operation is to use a viscometer at the size box.

Since viscosity changes with size-box temperature, temperature controls are also necessary.

Yarn stretch in slashing should be held to a minimum because too much stretch weakens worsted-synthetics blends. Too much pressure at the beam also weakens the yarn.

Keep Loom Beams Aligned

On gabardine fabrics, it is important to keep the loom-beam flanges set no more than 1 in. wider than the reed width of the cloth. Controlling

the width of the warp between the beam flanges prevents selvage ends from chafing and also reduces warp breakage.

The flanges on the loom beams should also be tight against the beam barrels and perfectly true. To keep loom beams in good condition, have employees move beams only on trucks. Dragging beams across the floor causes them to get out of alignment.

Beam flanges out of alignment cause high and low places in the warp as the warp is wound off at the loom. This condition causes the cloth to weave tight on the high part and loose on the low part.

Another result of warps slashed on beams that are out of alignment is that the cloth will slip out of the temples when the warp slackens on the low part.

Careful attention to little details in slashing, such as keeping loom beams aligned, will help keep weave-room efficiency high.

One of the most important things to watch in preparing gabardine warps is to keep the ends from being crossed. Give special attention to the type of tape used at the slasher for holding the ends. Tapes that dry up and allow the warp ends to roll should be avoided. The tape should hold the ends firmly but should also release the ends without breaking them when it is removed.

Cloth Must Be Clean

Good weaving practices start with cleaning the loom thoroughly before a warp is put in. Oil and grease stains cannot be removed easily and cause serious problems when light shades of gabardine fabrics are finished.

Although it is sometimes possible to remove grease or oil stains with a cleaning fluid, there is always the chance that the solvent will remove so much of the natural oil from the fibers that the spot will show after the cloth is dyed and finished.

The best way to prevent oil and grease stains is to train weavers and loomfixers to keep oily hands and tools off the cloth.

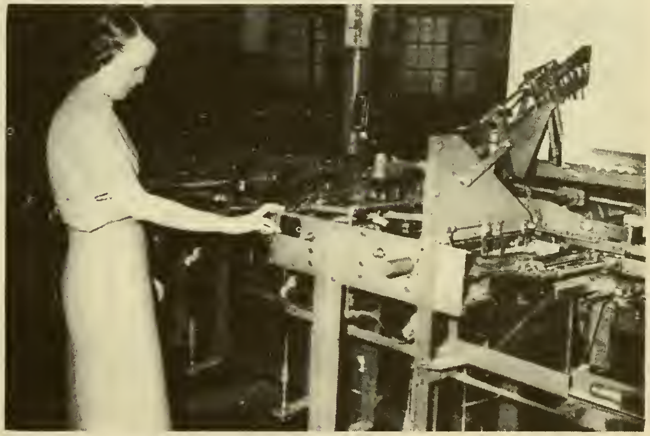
Oil stains are sometimes caused by overlubricating picker rods. Oil-soaked leather bumpers on the picker rod will also throw oil on the cloth. Petroleum jelly substituted for oil in lubricating the picker rod often helps eliminate this trouble. Pickers that do not require lubrication are also a help.

Oil spattered from the picking roll and picking shoe soils a lot of cloth. A sheet-metal guard fastened to the loom frame at the back of the picking shoe will prevent this type of oil stain.

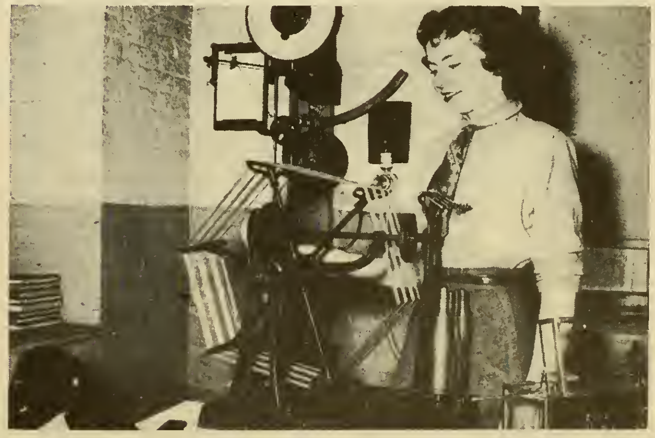
Drip pans under the harness sheaves prevent a lot of dirty oil from dropping onto the warp and woven cloth. The pans should be wiped clean and checked for leaks periodically.

Another trouble spot that results in oily cloth is the drip pans under the box-chain levers and sprockets. These pans must be kept free from oil.

Shuttle boxes should be cleaned



FILLING BUNCHES should contain 4½ picks of filling. Set the quiller bunch builder for this amount.



SYSTEMATIC TESTING of warp and filling yarns will uncover yarn defects and serve as a guide in preventing fabric faults.

thoroughly at each warp change. To clean the boxes properly, remove the binders so that all shuttlebox surfaces can be reached easily. While the binders are out, clean them, too.

Train loomfixers to carry a piece of cloth to wipe their hands on. They should also have an apron to fasten over cloth and yarn to prevent stains from greasy parts or tools. Supervisors should insist that this practice is followed at all times.

Tips for Better Weaving

To weave fine gabardines, use only harnesses that are in good condition. Bunched-up heddles are certain to cause warp streaks.

Reeds with damaged dents should be repaired or discarded. One open dent can cause a reed mark that will result in a second-quality cut of cloth.

Temple rings should be taken apart, cleaned, inspected, and lubricated at warp changes. White petroleum jelly provides good lubrication with little chance of staining cloth.

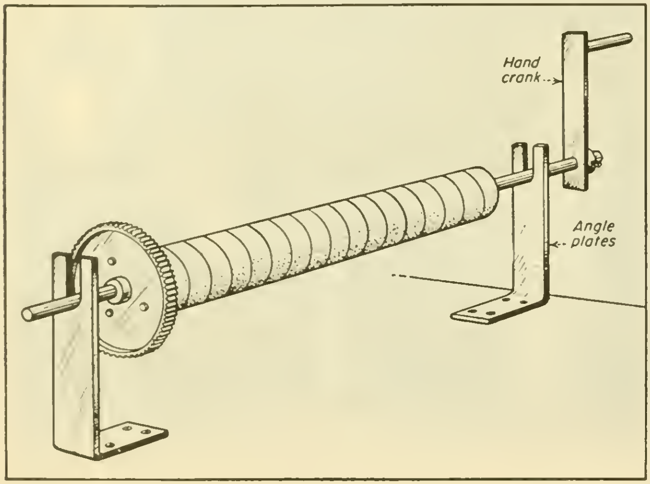
Replace the last ring that holds the selvage with a special ring equipped with a multiple row of pins. This ring will help the temple hold the cloth in a straight line. If temples hold the cloth out to the full width of the yarn in the reed, end chafing and breakage will be reduced.

Set filling winders so that the bunch on the bobbins contains at least 4½ picks of filling. Bobbins with less filling tend to cause filling run-outs.

Enough filling should also be left on the bobbins to pull the loose ends out of the shuttle when the empty bobbins fall into the bobbin can. If the amount of filling is insufficient, the loose ends will stay in the shuttle eyes and be woven into the fabric in the form of drag-ins or double picks.

All yarns, both warp and filling, should be tested for evenness and breaking strength. Any variation in standards should be corrected immediately.

Use This Device To Re-cover Take-Up Rolls



TAKE-UP ROLLS are covered quickly and neatly when they're placed in the angle plates on a workbench and turned with a crank.

Re-covering take-up rolls with rubber or composition covering material is always a ticklish job.

We have made a device to quickly and easily re-cover take-up rolls after they're removed from looms.

Two angle plates are made from flat-iron stock 12 ins. long, 3 ins. wide, and ⅜ in. thick. One end of the stock is bored 2 ins. from the end with a drill ⅛ in. larger than the take-up-roll journal. Then the stock is slotted to the hole.

Four ⅜ in. holes are bored in the other end of the stock for lag screws. A 4-in. section containing the lag-screw holes is bent at right angles.

A crank is made from flat-iron stock, a collar with a setscrew, and a section of round cold-rolled steel. The collar is just large enough to slide easily on the journal of the take-up roll. One end of the flat stock is welded to the collar, and the other end is bored to receive a section of ⅝-in. round stock 6 ins. long to be used for a handle.

One angle plate is fastened with lag screws to the edge of the front corner of a long workbench. The other angle plate is fastened to the backbench so that the take-up roll can be dropped into the slots and be supported by the angle plates.

To re-cover a take-up roll, the whole take-up-roll assembly, including the 75-tooth gear, is placed in the slots. The collar of the crank is slipped over the end of the take-up-roll journal at the corner of the workbench, and the setscrew in the collar is fastened.

The old covering is removed. The surface of the roll is cleaned thoroughly and is roughened with coarse emery cloth. Glue is applied to the roll and, for best results, should be allowed to dry slightly before the new covering is applied.

The take-up-roll covering is held on a reel placed on the floor at the front of the workbench. When the roll covering is put on the roll, one man turns the crank and another man guides the covering at the correct angle.

The device is built cheaply and does a neat job of re-covering take-up rolls. *Eugene P. Schremp, Waterville, Me.*

Here Is a Layout for 65% Wool, 35% Dacron Top

Technical Editor:

Could you give us a layout for making 250-gr.-per-yd. sliver with a 65%-wool and 35%-Dacron blend. We want to use 6-in., 64s domestic wool and 5¾-in. Dacron. (9629)

Assuming that you want to blend in the first gilling operation after combing, here is a workable layout.

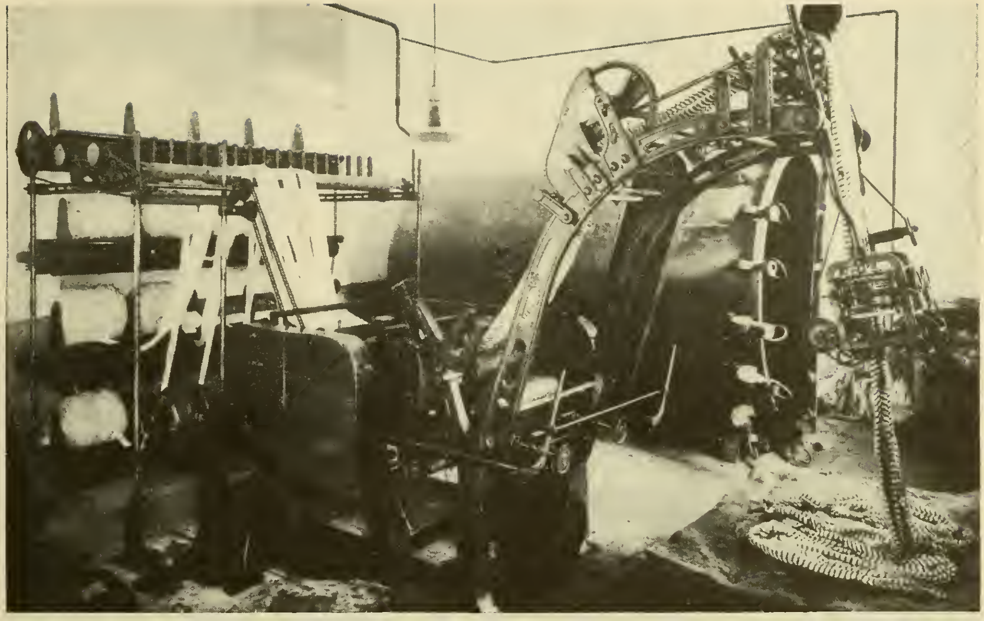
First Finisher or Can-Gill Box

If comb sliver weighs 0.75 oz. per 5 yd., use 20 doublings going into the box and a draft of 6.45. The weight of wool sliver delivered should be 186 gr. per yd.

Second Finisher or Baller-Gill Box

Use five doublings of wool sliver made on the first finisher and five doublings of Dacron, 100 gr. per yd., or 10 doublings of Dacron, 50 gr. per yd., and a draft of 5.72. The weight delivered should be 250 gr. per yd.

Note: Total weight entering the first finisher must be 1,200 gr. per yd.; therefore, if comb sliver varies from 0.75 oz. per 5 yd., it will be necessary to use more or fewer doublings to keep the total weight entering at 1,200 gr. per yd.



SLIVERS, processed in the regular gill box on the unit, form a web on which the grooved printing rolls print stripes. The stock is piled loosely and allowed to dry overnight. The autoclave in the background fixes the dye on the wool. Backwashing then removes superfluous dye paste.

Modern VIGOUREUX PRINTING Produces Uniform, Fast Colors

▶ **No other process can duplicate the even shades on worsted top dyed by Vigoureux printing. Chromium dyes are producing colors fast enough for men's-wear fabrics.**

BY USING THE Vigoureux printing process, a mill can produce good blends of white and colored tops for fine worsted fabrics. Even several preparing and doubling operations on intersecting gill boxes do not produce such uniform-colored blends.

The demand for extra fastness, however, has made necessary the addition of newer techniques. Instead of acid dyes, for example, faster chromium dyes are being used.

In the Vigoureux printing process, wool slivers are passed through a regular gill box with rolls at the delivery end to print on the passing web. A rubber-covered roll, immersed in the dye, transfers the color to a carrying roll from which the printing rolls pick up the dye.

Diagonal grooves on the printing rolls print the dye in parallel stripes on the slubbing, and the type of roll used determines the amount of color on the top: rolls with a greater area of raised surface deposit more dye. The make-up of the printing paste also influences the shade of the blend.

In a dye kettle with a false bottom, a dye-fixing compound is prepared: 2.5 kg. of British Gum (Dextrinose Starch) and 97.5 kg. of water are mixed in the upper section of the kettle, and the bottom is filled with water. A stirrer is used to keep the compound in motion until the starch is completely dissolved. The dyestuffs are then dissolved in boiling water, and the fixing compound is added according to the formula.

Then 1% glycol or similar oils, 1.5% pine oils to prevent foaming, and sodium chlorate are added. The solution is raised to the boiling point, and chromium acetate 20° Be. is added. The following is a typical dye formula:

Black 25-50% Color For 100 kg. printing paste	Grams
Black chromium dyestuff powder A.S.	6,750
Green Alizerine G.	150
Yellow chromium dyestuff	100
Water	34,000
Fixing compound	35,000
Starch (regular quality)	6,000
Sodium chlorate	1,200
Chromium acetate 20° Be.	17,000

The density of the web should allow the dye to penetrate both sides. After being printed, the stock is loosely piled on a stainless-steel basket and allowed to dry overnight.

Based in part on information received from Ernest L. Frankl Associates, New York, N. Y.

Color Fixed in Autoclave

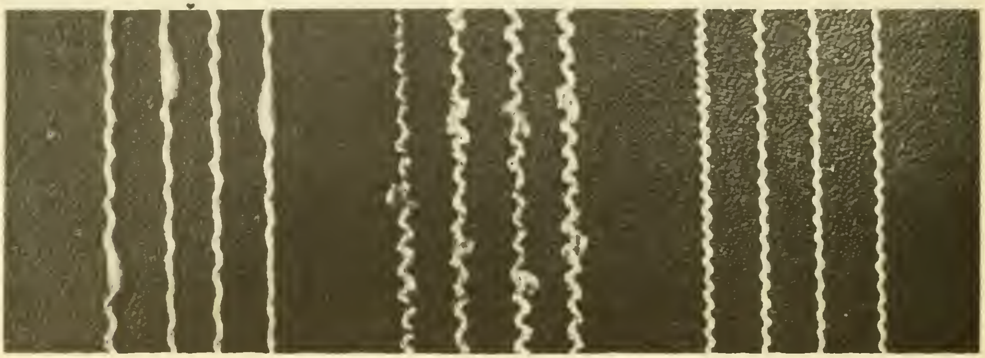
The color is fixed on the wool in an autoclave. Different dyestuffs need suitable steam pressures and temperatures. Acid dyes require no steam pressure, but steam pressure is absolutely necessary for chromium dyes. One mill prefers to cover the wool with a fabric when it is placed in the autoclave. This mill processes printed slubbing at 100 lbs. per hr.

A minimum pressure of 0.75 atmosphere is necessary in the ager. As a general rule, in fixing black and dark colors, a pressure of 0.5 atmospheres and a temperature of 240 to 245° F. is required for a 2-hr fixing period. For lighter colors, the time is lengthened 1½ times.

The steam initially used has a high acid content and should be released, as should a small amount of steam all during the process. While too much steaming yellows the undyed wool, too little steaming does not set the color.

In the steaming operation, some of the dye penetrates the unprinted portion of the stock with varying intensity. This random dyeing of the fibers helps produce the complete color uniformity in the top. After the steaming process, the top should be backwashed to remove the excess dye and fixing compound. One run through a five-bowl backwasher will remove all traces of the dye paste.

One man is required to process the top from printing to backwashing.



NOVELTY YARNS are varied by chain setup, yarn number, and spindle and roll speeds. From left to right are nub, ratine, and boucle.

How Lorraine Makes Three NOVELTY YARNS

- Nub yarns are made with irregularly rotated top rolls
- Ratine yarns are made with fast bottom rolls
- Boucle yarns are made with S- and Z-twist yarns

By **JAMES H. BLORE**, Assistant Editor, TEXTILE WORLD

Of the wide variety of novelty yarns produced by Lorraine Yarn Mills, Inc., Philadelphia, Pa., three popular numbers among weavers and knitters this year are nub, ratine, and boucle yarns. Here's how Lorraine produces these three types of yarns.

The yarn arrives from the yarn manufacturer on tubes. The tubes are placed on a creel over the twister frame. The creels hold up to 2,000 lbs. of yarn, and the yarn packages are supported on nearly horizontal spindles in rows five deep.

Doffs Are Kept Equal Size

The novelty twisters, made by Collins Bros. Machine Co., have 200 spindles each. One girl tends one frame, but she receives help from other operators to doff. A counter driven from the ring rail keeps doffs of equal length and warns the operator of the doffing time.

Spindle speed is about 4,000 rpm. The yarn is twisted on double-end bobbins. The ring diameter is 3½ ins. The ball-bearing spindles are oiled once each week.

Each frame is driven by a Cleveland Electric motor through a five-ply V-belt. The motor is bolted to a specially constructed frame. When a frame-speed change is required, the frame pulleys are changed and the motor is raised or lowered by adjusting the bolts.

Yarn constructions are worked out prior to twisting by Superintendent A. LaPierre. He determines the yarn numbers, spindle speeds, roll speeds, and chain arrangement at his desk.

Nub Yarn Is Rayon and Cotton

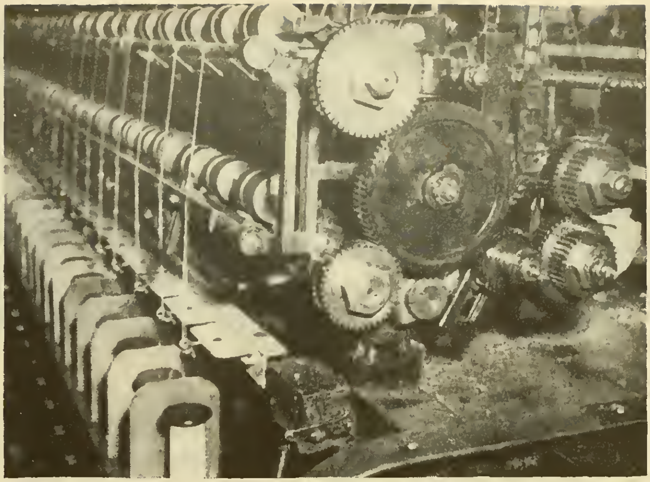
One popular nub yarn is made from 900-den. rayon and 20s cotton. The finished size of the yarn is 1,250 yds. per lb. Two ends of 20s cotton are fed to the top rolls, and the 900-den. yarn is fed to the bottom rolls. The top roll is driven by a clutch that has an intermittent action. The clutch is controlled from a chain, which has high and low links. A high link on the chain stops the shaft.

The links are arranged to space the nubs at irregular intervals to prevent patterns in the cloth woven or knitted from the yarn. One nub is made approximately each second.

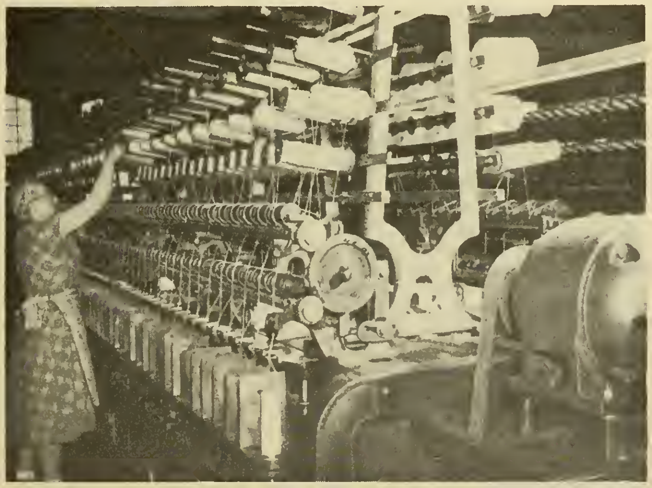
The top roll runs the full width of the frame and drives individual rolls that rest on plain bearings. A separator bar controls the yarn and prevents the twist running back to the supply package.

The nubs in the nub yarns are locked in position on a fancy twister frame with 300-den. rayon. The nub yarn is fed to the top rolls, and the rayon is fed to the bottom rolls. The rayon-yarn cones are positioned on the creel with adapters that slide on the creel pins. Speeds of the top and bottom rolls are identical.

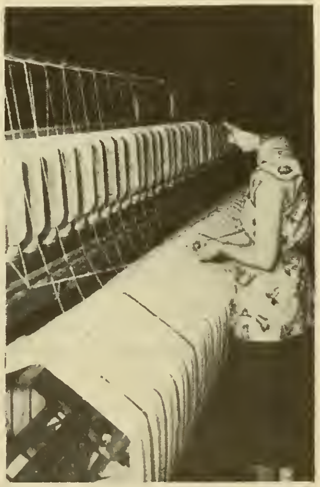
CREEL on 200-spindle novelty twister frame holds 2,000 lbs. of yarn in rows five deep.



NUB YARN is made with intermittent motion of the top roll. The motion is controlled from the chain.



NUBS are locked in position with 300-den. rayon on this frame. Both rolls are of equal speed. The nub yarn is fed to the top rolls.



SHIELDS between bobbins on skein winder prevent yarn tangling.

Ratine Is Heavy Yarn

One ratine yarn is made with two ends of 20s cotton yarn and two ends of 900-den. rayon. The bottom roll is driven twice as fast as the top roll. The loops in the yarn are formed on the nubbing bar.

A worsted boucle yarn used for knitting is made from two ends of 20s yarn. The bottom rolls turn twice as fast as the top rolls.

S-twist yarn is fed to the top rolls, and Z-twist yarn is fed to the bottom rolls. The resultant yarn number is 7s worsted.

All yarn is then wound from the double-end bobbins into skeins for dyeing. Each reel winds 25 to 40 skeins. The reels rotate about 200 rpm.

The four skein winders are tended by four girls who work as a team when the skeins are ready to doff or new bobbins are to be tied on. As each bobbin contains an identical amount of yarn, the bobbins all run out at one time. Two bobbins are required to make one skein; so very little waste is made.

Shields between bobbins prevent flying yarns from tangling. The yarn is traversed over the reel, and a lease is made on each skein.

After dyeing, the yarn is returned to the mill and wound onto cones or tubes.

The mill, which has 4,000 twister spindles, 500 reeling spindles, and 400 winder spindles, produces 35,000 to 40,000 lbs. of novelty yarns weekly, working on a three-shift basis.

Five Things You Need To Know To
CONTROL WASTE

Questions and answers on—

- **Things you need to know about waste in your mill**
- **How to find the answers to the waste problems in your own operation**

▶ What is the best way for a mill to keep track of how much waste it is making?

Most mills weigh and record the amounts of different types of waste—card fly and strips, soft waste, hard waste, sweeps, etc. But each mill should also know how much raw material (cotton, wool, rayon, or other synthetic fiber) it takes into the plant and how much material comes out as finished product and as waste.

In many cases, the total pounds turned out will amount to more than the weight of the raw material put in. To find out how much waste you've really made, you need to know how much water was in the raw material when it entered the plant and how much water, starch, and size are in the finished goods that go out.

▶ How do you find out how much salable waste has cost you?

There are three items of cost in your waste: (1) the cost of the raw material, (2) the cost of processing the fiber up to the point where the waste was made, and (3) the cost of whatever materials (tint, dye, starch, size, etc.) you have put into the product up to the point where the waste was made.

The sales value of the waste subtracted from that total cost of the waste gives you the net cost (or loss) of the waste to the mill.

Sometimes it is surprising to find out what that cost amounts to. Some filament-rayon mills hold it to 1.5 to 2¢ per pound of fiber entering the plant. In some worsted mills, it runs as high as 60 to 70¢ per pound.

———

Based on a paper presented by James I. Teat, Southeastern Engineering Co., at a meeting of the Southern Textile Assn.

▶ How should you go about reducing waste?

The first step should be to find out how much waste you are making at every process. Then find out how much of it is necessary.

At every process and with every type of fiber, you have to make some waste in order to keep up the quality of your product. For example, you don't want the motes, trash, leaf, etc. in raw cotton to go into your product; and you don't want every inch of warp on the beam to weave into your cloth. Or take a quill of filling; we know that for quality production we have to leave several yards of filling on the quill.

However, any waste above the amount necessary for quality production is excessive. So waste reduction should start at that point.

We might say that there are five things you should find out:

1. How much waste you are making
2. How much it is costing you
3. How much of it is excessive
4. How much can be saved
5. How to save it

▶ What are the major causes of excessive waste?

Probably everyone agrees that the biggest cause is carelessness of the worker. Perhaps the next most important cause is that the worker is not sufficiently skilled in the job he is doing.

▶ Can a mill take a set of predetermined waste standards and apply them to its operation?

It is so unlikely that you might say that it's impossible. One mill may have the same machinery, use the same raw material, and manufacture the same products but handle its waste a little differently from another mill. Take spooler thread for an example. One mill may count as spooler-thread waste only the waste that the knotter drops out. Another mill may also include tailings.

Actually, the best way for any mill to approach its waste problem is to analyze the problem in each production department and at each process in the department. Waste standards should be set up as realistically as timestudy men set up a work assignment.

Here's a Round-Up On WASHABLE WOOLENS

▶ **For many years, finishers of wool fabrics have been struggling to produce completely washable fabrics. The goal is being attained, but some difficulties still exist. In order to make a shrink-resistant, washable fabric, the finisher must—**

- **Eliminate felting shrinkage**
- **Eliminate relaxation shrinkage**
- **Use washfast dyes**

By E. A. MURRAY, Chemical Engineer

COMPETITION FROM OTHER FIBERS has increased the demand that woolen sportswear, children's clothing, and blankets be made washable. Although shrink-resistant wool fabrics are being produced, they have not had complete consumer acceptance for two main reasons:

1. Most existing commercial shrink-resistant processes impart certain undesirable qualities to the fabric.

2. In a truly washable woolen fabric, felting and relaxation shrinkages must be eliminated and sufficiently bright, washfast dyes must be used. To meet any one of these requirements completely is difficult; to meet all three has, up to now, been all but impossible.

Why Wool Shrinks

The amount of shrinkage in a laundered wool fabric depends on several factors such as fiber composition, cloth construction, and severity of laundering. Two different types of shrinkages affect a laundered fabric. In order to produce a washable woolen, the finisher must consider each:

1. **Relaxation shrinkage** is the tendency of the fabric to return to its original form before the stresses of finishing operations distorted it. Relaxation shrinkage, not peculiar to woolens, exists in all fabrics that have not been treated to remove it. In Sanforized cottons, for example, relaxation shrinkage has been eliminated by compressive shrinking.

2. **Felting shrinkage** is a property of most animal fibers such as wool, mohair, and rabbit fur. Fabrics having a high content of wool or other animal fibers do not stop shrinking after the first washing. This type of shrinkage cannot be prevented by a mechanical process like compressive shrinkage and a felted article cannot be restretched to its original shape.

In this article we shall deal for the most part in evaluating past and present processes for preventing felting shrinkage.

Fiber Surface Causes Felting

The exact principles of felting shrinkage are not completely understood. A basic factor, however, is unquestionably the surface structure of the animal fibers. These fibers, when viewed through a microscope, appear to be covered with tiny, sharp, ratchet-like projections similar in shape to the teeth of a file. The sharp edges all point toward the fiber tip. Thus, when the fiber is pulled in the direction of its tip, the pointed edges will produce considerably more friction than when it is pulled in the direction of its root. This phenomenon, called directional frictional effect or D.F.E., causes the fiber to travel, when flexed, in the direction of the root end.

Surface Change Stops Felting

All commercial shrinkage-control processes for wool depend on reducing the sharpness of the projections on the fiber surface. The sharp edges can be removed, or the spaces under them filled with an insoluble material.

Woolen fabrics milled with fine abrasives, such as silica or Carborundum suspended in oil, have been prevented from felting. The effect is like sandpapering the fibers to remove the scales. Such processes have never been commercialized because weight loss and damage are high before the shrinkage is adequately controlled.

In another process, enzymes are used to digest the rough surface. An enzyme called papain was used in a treatment patented in England nearly 20 years ago. However, damage to the fiber and high cost have prevented the process from becoming commercially successful.

The Tootal-Broadhurst-Lee method subjects wool to caustic soda in a solvent mixture of alcohol and naphtha. Wool, which is rapidly attacked by sodium-hydroxide solutions in concentrations below 15%, can be easily stabilized by this method. However, it is easily damaged in the process, and insurance companies frown upon the solvent method. So far as is known, the caustic process has never been used commercially in this country.

Among the most popular methods of preventing felting shrinkage by removing surface roughness are the Sanforlan and Harriset processes. Both these methods use chlorine to oxidize the fiber surface. They both have been used commercially to process considerable yardages of both civilian and military fabrics. There are a number of other chlorination processes, but these two have met the most general acceptance in the United States.

The Sanforlan process, controlled in the United States by Cluett-Peabody & Co., was developed in England and is known there as the

Stevenson-Wolsey process. The fibers are oxidized by a dilute mixture of sodium hypochlorite and potassium permanganate under closely controlled concentration, temperature, and pH. The dilute bath usually contains 2 to 3% available chlorine based on the weight of the goods. After the chlorine treatment, the fabric is treated with an antichlor to remove traces of unreacted hypochlorite. The Sanforlan process is a batch method, and the hypochlorite is generally applied to the fabric in a dye kettle.

The Harriset Process, developed by Harris Research Laboratories, Washington, D. C., is a continuous chlorination process for both wool top and piece goods. The wool is treated in relatively concentrated hypochlorite solutions, normally containing between 1 and 2% available chlorine based on the bath weight. After a very brief exposure to the hypochlorite solution, usually not more than 10 secs., the fabric is treated with an antichlor. Good stabilization requires close control of temperature, concentration, time of exposure, and pH.

When properly treated, chlorinated wool has excellent stability with a minimum of damage. Despite the necessity for close controls, the chlorination processes do not present unusual difficulties to the finisher. The Department of the Army has purchased several million yards of chlorinated woolens since the end of World War II.

However, several drawbacks are present in chlorinated woolens:

1. The wool, despite careful treatment, loses weight and is somewhat damaged.

2. The natural water repellency of the wool is reduced.

3. Chlorinated wool usually feels harsher than untreated wool.

4. It is difficult to treat heavy fabrics such as blankets. By the time the fibers inside the fabric are adequately treated, surface fibers are likely to be damaged.

Resins Inhibit Felting

Many products can be used to mask the projections on wool fiber surfaces to eliminate the directional frictional effect. Most of these products are synthetic polymers or polymer-forming materials. However, certain melamine resins are the only ones that have been used in substantial volume for commercial wool stabilization. American Cyanamid's Lanaset and Monsanto Chemical's Resloom are examples of these melamine resins.

The melamine resins are supplied either as dry powders or as clear water solutions. Two methods of application are used. In the older process, the goods are padded in a bath containing resin, an acid catalyst, and a wetting agent. The fabric is then dried and cured at 290 to 300° F. for approximately 5 mins. The cured resin becomes hard, permanently insoluble, and firmly attached to the wool. It will withstand repeated launderings and controls shrinkage very well when properly applied. After being cured, the fabric is usually given a light scour in a bath containing mild alkali and a synthetic detergent to remove uncured resin.

Lately, the original melamine-resin process has been modified to a more effective method known as the acid-colloid treatment where the regular resin is partially cured before being applied to the fabric. The colloid is prepared by treating the resin with acetic or glycollic acid. After ageing for several hours, the resin changes from a true solution to a partially polymerized colloidal dispersion. This dispersion, padded on the fabric, cures at lower temperatures, and less resin is required than with the older process. Both processes have been used commercially on substantial yardages of consumer and military fabrics.

While a number of polymers in emulsion or latex form have been suggested for wool-shrinkage control, few have found widespread industrial acceptance.

The new Australian SI-RO-FIX process controls shrinkage by applying a chemically modified nylon to the wool from an alcohol bath. Excellent shrinkage control has been reported, and a number of mills in this country are now evaluating the method. The disadvantages of solvent processes in finishing plants will probably be an obstacle to the widespread acceptance of this process.

However, the additive treatments also have their drawbacks. The most serious of these is probably the stiffness of the treated fabrics. The stiffness is caused by an excess of resin solution between the fibers that binds some fibers together during drying. A very high squeeze pressure in padding can minimize the stiffening, which is very difficult to eliminate completely. Softeners, occasionally helpful in restoring the original hand, are not very fast to laundering. The consumer's demand for a desirable hand in a fabric is largely responsible for the lack of widespread acceptance of resin treatments.

Overfeeding Is Not the Answer

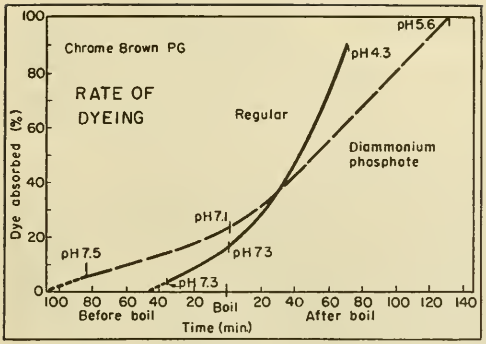
To produce a washable woolen fabric, it is necessary to reduce relaxation shrinkage to a minimum. However, no method comparable to the Sanforized process is available for woolens. The best results, usually obtained by overfeeding, do not approach those obtained in the compressive shrinkage process on cottons. The relatively loose construction of woolens makes it unlikely that wool shrinkage tolerances will ever be made as low as cotton tolerances.

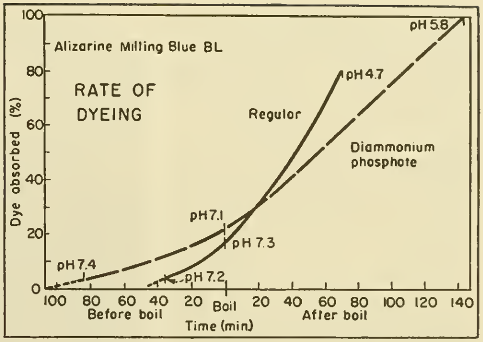
Dyes Must Be Washfast

Almost as important as adequate shrinkage control is the problem of selecting dyestuffs with the desired brightness and the necessary washfastness on the stabilized fabric. Conventional acid dyes are not well suited for fabrics that will be washed repeatedly. With few exceptions, they bleed in laundering.

Chrome dyes, metallized dyes, and the newer neutral-dyeing metallized dyes are relatively colorfast. However, these dye classes are not yet available in a full range of bright shades.

It is impossible to arrive at an average cost for washable finishes because processing costs vary so widely through the industry. Chlorination is less expensive than resin treatment, but higher resin cost is partly offset by added fabric weight.





TWO TYPICAL DYEING CURVES show the relationship of the DAP process to regular dyeing procedure. In each case the DAP curve is less steep, showing a more gradual deposition of dye; longer, showing more yield of color; and more uniform in pH drop, showing buffering effect of DAP. Points on the curves are determined by spectrophotometric measurement of sample swatches.

Pacific Mills DAP Process Improves WOOL DYEING

The diammonium phosphate (DAP) process for wool dyeing takes longer than regular dyeing procedures, but it is said to have these advantages—

- **The fastest colors can be used**
- **Heavy, high-twist fabrics are uniformly dyed**
- **All dyestuffs yield more color value—up to 40%, average 20%**
- **Costly reworks are practically eliminated**
- **Evenness, bloom, and solidity of shade are reproducible**

JOHN N. DALTON, director of chemical research, Pacific Mills, Worsted Div., (center) discusses the DAP process with John P. Ploubides, superintendent of dyeing, (left) and Gerald M. Cote, textile specialist, Victor Chemical Works.

By GEORGE M. MOISSON
Assistant Editor, TEXTILE WORLD

PACIFIC MILLS, Worsted Div., Lawrence, Mass., has been working with diammonium phosphate for over 8 yr. In that time a thorough evaluation of many dyestuffs—dyed by DAP vs. regular procedures—has been made.

Victor Chemical Works, Chicago, Ill., has purchased the patent rights from Pacific and will issue certificates granting free use and technical service to mills desiring to use the process.

Why DAP Works

DAP is a strong "buffer"—that is, in solution it creates a pH control that is hard to upset, even when appreciable amounts of acid or alkali are added. At normal temperatures, below the boil, $(NH_4)_2HPO_4$ solutions are mildly alkaline; at the boil, NH_3 is given off slowly, reducing the pH at a gradual rate.

Wool dyes have great affinity for the fiber when solution pH is 7 or below. Naturally, some types of dyes have more affinity than others and must be controlled to obtain even and reproducible results time after time.

Generally speaking, dyestuffs in molecular solution have less affinity and dye more evenly and more slowly than dyestuffs in colloidal suspension.

One of the most important effects of DAP is to decrease particle size of colloidally dispersed colors and thus reduce their affinity during the critical period when pH drops below 7 shortly after the boil is reached and the wool is in condition to accept the color.

Condition of Wool Is Important

Unless a mill degreases its own wool and has positive control of every batch, the pH of the wool is bound to vary. Pacific has found that a conditioning bath of 5% DAP at the boil for 20 min. serves to swell the fiber, neutralize any acid or alkali present, and put the wool in an ideal condition for dyeing. This bath is then dropped, and a fresh bath with 5% DAP is prepared.

The DAP process lends itself well to continuous methods of wet finishing. Lengthy dolly-washing between carbonizing, dyeing, and finishing is not necessary because the buffering action of DAP makes the acid and alkaline residues ineffective.

Comparative Dyeings Illustrate Effectiveness

A group of dyeings picked at random from the files at Pacific showed swatches mounted on cards (the cards from which the spectrophotometric curves in the accompanying graphs were drawn) that compare samples taken from two dyeings run simultaneously, one DAP, one regular procedure. All dyeings were 2% color.

In each pair of dyeings the DAP swatches shaded gradually in depth from beginning to end of the cycle. No great variations were noticed, even at the beginning of the boil. All dyeings appeared heavier, looked more "bloomy," and showed better and more even coverage. These dyeings were all made on medium gabardines.

A few of the dyeings, with procedures and comments, follow:

Irgalan Grey BL (neutral) 2%

Pacific method

Wet out, 20 min. at boil, 5% DAP, drop, wash cold

Fresh bath, 5% DAP, 10 min. cold, add color, raise to boil in 1¾ hr. Add ½% Maxitol (highly sulfonated castor oil) before dissolved color is poured in

Boil 1 hr., add 1% ammonium sulfate

Boil ½ hr., add 1% ammonium sulfate

Boil ½ hr., add 2% ammonium sulfate

Total boiling time, 2½ hr.

Drop, rinse. Use ½% acetic acid (84%) in final rinse

Note: Acetic acid in final rinse inhibits bacteria growth while cloth is awaiting drying.

Regular method (sodium sulfate)

Bring cloth to boil in 45 min. with 10% calcined Glauber's salt. Dyestuff is added as soon as cloth is wet out. Boil 1 hr., drop, rinse.

Another dyeing of this Geigy dyestuff was made by the recommended procedure. A comparison of the three swatches showed the DAP dyeing to be 20% heavier, more bloomy, with more uniform coverage than the others. The regular method produced a dyeing that was redder in cast, hungry looking, and less even. The dyeing made by the recommended procedure was greener in cast but otherwise quite the same as the regular dyeing.

Cibalan Brown TL (neutral) 2%

Pacific method

Same as previous dyeings.

Regular method

Same as regular method above, except 3% ammonium sulfate is added with the Glauber's salt.

These two dyeings showed the DAP swatch to be 15 to 20% heavier, not so hungry looking, and slightly redder.

Lanasyn Green BL (neutral) 2%

Two dyeings of this color were dyed exactly like the Brown TL above. The DAP sample looked nearly 30% heavier, slightly bluer, and bloomier and had better coverage.

Irgalan Orange R (neutral) 2%

These two dyeings showed less difference than the others, but 15% increase in depth and somewhat better coverage were obtained by the DAP method.

Here Are Other Recommended Procedures

Bottom Chrome Dyeing

The chroming bath is prepared as follows:

1% chrome
3% tartar
0.25% anionic wetting agent

The bath is raised to the boil, and boiling is continued for 1½ hr. The cloth is washed; then 5% DAP is added. After the bath is run for 10 min., the dyestuff is added (previously dispersed in an adequate amount of water at about 150° F. and well stirred). The temperature is slowly raised to the boil. The length of time is governed by the weight and construction of the fabric. Boiling is continued for 2 hr. Exhaust with 1 to 2% ammonium sulfate after 1 hr. at boil if necessary.

Meta Chrome Dyeing

Before dyeing, the cloth is treated with 5% diammonium phosphate for 20 min. at 180° F. and then rinsed. This treatment neutralizes any acidity in the cloth from the wet finishing.

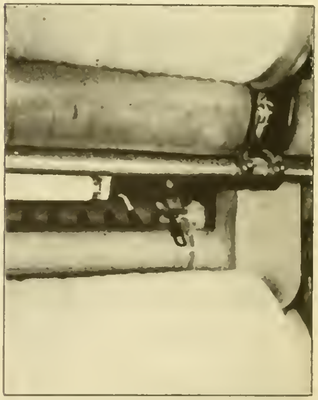
The dyebath is prepared as follows:

XX% chrome desired
5.0% DAP
1.0% highly sulfonated castor oil

The bath is run for 10 min., the dyestuff (previously dispersed in an adequate amount of water at about 150° F. and well stirred) is added, the temperature is slowly raised to the boil, and boiling is continued for 2 hr. Exhaust with 1 to 2% ammonium sulfate after 1 hr. at the boil.

Kinks and Short-Cuts

Fluorescent Tube Lights Dark Area of Woolen Card

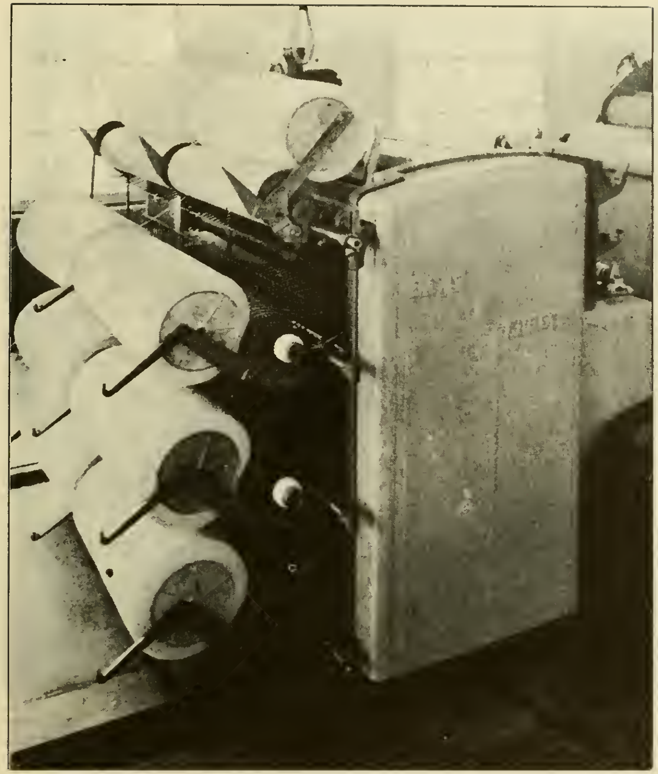


ONE FLUORESCENT TUBE set right in front of each set of rub aprons improves visibility in an otherwise dark area. This card is also equipped with a suction device for broken ends, but the need for light is important on any woolen card.

Worsted Carder Grinds Fancy When Clothing Is Changed

Some carders think you should put on new fancy clothing to prevent damage to new wire when the cylinder has been reclothed.

All I do is grind the fancy with a carborundum wheel, and I've already saved a lot of money. The cylinder clothing isn't hurt at all.



EiGHT 24-END SPOOLS on this 84-in. card deliver 110 lb. per hr. Speeds and settings for the wide card are conventional, and the mill experienced no difficulty in setting the cards up.

84-in. WOOLEN CARDS
Pay Off at New England Mill

▶ Production of 110 lb. per hr. at 90% efficiency is one reason this woolen mill likes the new Davis & Furber wide cards. Unit costs are lower, and yarns are better.

By MICHAEL J. KOROSKYS
Assistant Professor, Wool Department, Lowell Textile Institute

One 84-in. card at a small New England woolen mill is taking care of four 144-spindle spinning frames in an efficient, smooth-running setup. Card production, now about twice as much as the mill formerly got from a 60-in. card, has been as high as 140 lb. per hr. on 2⅞-run roping.

Normally, the mill runs its four new wide cards on 2⅞-run roping at 110 lb. per hr. in 192 ends at 90% efficiency. One cylinder and one doffer are stripped every 24 hr. of running time; and the entire stripping time, from running out until all the ends are up and running again, is 1 hr. for two men.

Workloads Are Better

The machine assignment for the 84-in. cards is the same as for four 60-in. cards. One man tends the four finishers, and one man takes care of the four feeds and the alleys. Since the production on the four new cards is about 440 lb. per hr., where the four older cards produced a total of 200 lb. per hr., there was a significant drop in carding costs per pound of roping.

Lots Are Larger

The lots run on the wider cards are large enough to overcome the production loss caused by stripping between lot changes. The mill thinks that the minimum lot size should be the amount of stock that can be carded between strippings. On 2⅞-run, for instance, minimum lot size for one card is about 2,600 lb. On 5-run, where stripping needs to be done only every third day, the lot size should be three times as large, or about 7,800 lb., for most efficient operation.

Some Changes Are Necessary

Preventive maintenance plays an important part in the operation of these wider cards. If some minor difficulty causes the card to be stopped, the resultant loss in production is tremendous. All necessary checks, adjustments, and maintenance procedures are carried out by the mill while the card is stopped for stripping or grinding.

Stripping is done with a vacuum system to avoid damage to the clothing that might result if the long rolls necessary for hand stripping should get sprung during handling.

Grinding takes a little longer than on the 60-in. cards because there is more surface to grind. Grinding presents no special problems except that greater care is exercised in handling the long grinding rolls.

Speeds can be changed while the card is running, and the results of minor changes can be detected quickly. If the fancy is causing too much fly or the card is loading up, the mill changes the fancy speed. This adjustment is a minor one because the fancy drive is independent of the stripper drives.

The mill has a dickie roll on the doffer to remove vegetable matter that gets by the Peralta rolls. Plastic tapes were tried and rejected in favor of leather tapes. Fancy covers were removed because the mill prefers to control fly with humidity.

Speeds and settings of carding parts are conventional.

EACH OPERATOR does her own weighing on a direct-reading floor scale next to the pin drafter. The weights of the two cans from the two-headed delivery are tabulated, added, and plotted directly on the control chart. No conversions or interpretations are necessary.

Sum Chart at Rochambeau Worsted Controls SLIVER VARIATION

► Each pin-drafter and gill-box sliver can used as a weigh box at Rochambeau Worsted has its own control chart. Each operator keeps the chart for her machine. Control limits are based on experience, and a prepared chart form makes preparation, tabulation, and control simple and easy.

By **LOUIS F. PAYETTE** Quality-Control Technician, Rockambeau Worsted Co.

At Rochambeau Worsted Co., Providence, R. I., we use a sum control chart in our gilling and pin-drafter operations to control variation. A gear change often introduces more variation. With this control chart we can tell at a glance if a gear change corrected an out-of-control point.

Besides providing a spot check for the supervisors, the chart method is much easier for the operators than the old method of matching cans. The operators like the chart because its use gives them a sense of responsibility and prestige. Also, one operator reported, "I didn't know what a gear change meant until I started using the sum chart. Now I see what happens to the work. The chart is simple and easy to use."

How the Chart Is Used

The cans, which are equalized with solder, are weighed on a direct-reading floor scale. The scale is located at the side of the pin drafter or gill box. Each operator does her own weighing, and she keeps the control chart at the scale. She is kept posted of lot changes on her machine.

The chart is checked by the overseer several times while a lot is in process. When a lot is completed at the weighing operation, the chart is given a final check by the departmental overseer. The completed charts are kept on file in the quality-control laboratory.

All data necessary for the control chart are tabulated on one form. At the top of this sheet, general

ROCHAMBEAU WORSTED CO., Providence, R. I.

Pin Drafter - Sum Chart

Lot 1100 Blend D.S. 100% Wool

Gr. wt. per yd. 131 Yd. per can 1200 Date 9/22/52

No. 1	22 1/4	22 1/4	23	22	22 1/2	22 1/2	22 1/2	22 1/4	22	22 1/2	22 1/2	22	22 1/4	22 1/2	23
No. 2	22 1/2	22 1/2	22 1/4	23	22 3/4	22 1/2	22 3/4	22 1/2	22	22 1/4	22 1/2	23	22 1/2	22	22
Sum	44 3/4	44 3/4	45 1/4	45	45 1/4	45	45 1/4	44 3/4	44	44 3/4	45	45	44 3/4	44 1/2	45

0									Gear changed 39 to 40						
1/4															
1/2															
3/4															
0															
1/4															
1/2															
43 3/4															
44 0									X						
44 1/4															
44 1/2														X	
44 3/4	X	X						X		X			X		
45 0				X		X					X	X			X
45 1/4			X		X		X								
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AN "X" OUTSIDE the control limits indicates that the process is out of control. The gear change necessary to bring the process back into control is based on experience. The next doff shows that the gear change made here was successful.

information is entered in prepared spaces for easy identification.

The weights of the cans from the two-headed unit are tabulated in the squares and then are added to get the sum. This figure gives a better control of variation than the average of the weights would because the variation is magnified. The sum of each two-can doff is plotted directly below in the same column on the control chart.

We print only the quarter pounds on the control chart; so the chart can be used for any range of weights by writing in the appropriate whole numbers alongside the fractions. The only other step necessary is to rule in the control limits. Write the weights in the left-hand column, rule in the limits, and you are ready to use the charts.

How To Get the Limits

The most important factor to consider in limit setting is the grain-weight-per-yard variation of the processed material. For instance, the limits for a wool-and-cotton blend would not be as close as for a 100%-wool set of drawing.

For the set of drawing shown on the control sheet, we used the first five doffs to figure the average gross weight per can at the doff. (These five doffs are the first 10 weights in the tabulation squares.) The average weight figures out to 22½ lb. per can. The average weight per doff is, therefore, 45 lb. This number is used as the midpoint on the control chart. The row of midpoint squares can be given a heavier outline for easy checking.

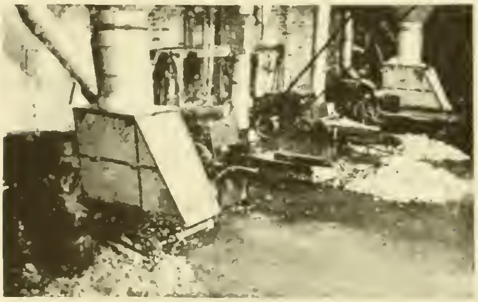
The control limits for the chart depend on the tolerance allowed for the particular lot. A formula can be set up to give the grains-per-yard equivalent of the pounds-per-doff allowance:

$$\frac{\text{Process Limit}}{\text{Yd. per can} \times \text{No. of deliveries}} = \text{Tolerance}$$

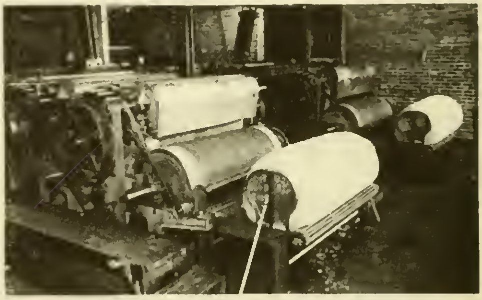
For this set of drawing, we allowed a ±½-lb. process limit. The control sheet shows that the yardage counter was set for 1,200 yd. per can. From the formula $\frac{(3500 \text{ gr.}),}{(2400 \text{ yd.})}$ the tolerance is ±1.45 gr. per yd. of sliver. The sliver was running at 131 gr. per yd., as also shown at the top of the chart form.

CAREFUL SORTING is the first step in reclaiming wool fiber. The stock is sorted for the kind of fiber, fabric type, and color.

FLOOR PILES OF STOCK, carefully selected for material and color, are sprayed with an oil emulsion to aid in later opening and garnetting.



A BATTERY OF RAG PICKERS opens the stock for the garnetts. The prepared stock is blown into storage bins behind the garnetts.



FOUR-CYLINDER GARNETTS clean, parallelize and blend the fibrous stock. Cross feeder above third cylinder was developed in this plant.

Careful Handling Means GOOD GARNETTING

HIGHLIGHTS: Garnetting isn't what it used to be. At every process from sorting through garnetting, careful handling and accurate machine settings are resulting in good fiber to extend our virgin-wool supply.

By E. H. HELLIWELL, Contributing Editor, TEXTILE WORLD

FROM RAGS TO FINISHED reclaimed wool fiber, let's follow the stock through a typical garnetting plant—Abrants Garnetting Co., Woonsocket, R. I. This modern, well-equipped plant processes all types of woolen materials and is known for the quality of its garnetted stock.

Sorting

Sorting of stock is the first step before actual machine processing. New rags or clippings are separated from old rags in the first sorting, and the next step is the separation of pure-wool materials from mixed-type materials. Divisions in sorting are made for the type of fabric—knitted, woven, felted, with hard or soft twisted yarns, fulled or unfulled. The final division is for color to better control the color blend of finished garnetted stock.

Dusting

Before or after sorting, dirty or dusty rags are run through a duster, which removes dirt and foreign material and assists in opening the stock for further processing. Dirty rags are sometimes cleaned or scoured, and mixed rags may be carbonized to remove the non-wool content. The stock of each sorting is spread on the floor in layers and is then sprayed with an emulsion of oil and water. The percentage of oil in the emulsion and the amount of emulsion applied depend on the stock. The emulsion is allowed sufficient time to penetrate the stock so that it will do its job of lubricating and softening up the stock for the next process.

Picking

Vertical "bites" of stock are taken from the floor pile and fed by hand to

the apron of the rag picker. The stock is held securely by fluted feed rolls while a large cylinder fitted with coarse steel teeth or pins reduces the stock to a partially fibrous state. The processed stock from the delivery end of the picker is blown into a storage bin to await the next process.

Garnetting

Stock from the storage bins is fed by hand into the hopper of an automatic feeder behind the garnett. The forward-moving bottom apron of the feeder brings the stock in the hopper in contact with a lifting spiked apron. The upward movement of this apron lifts the stock from the hopper, and the excess is combed off by an adjustable reciprocating comb.

After the stock passes the comb, it is carried downward, where it is stripped off into a scale pan. Equal predetermined weights of stock are deposited at regular intervals from the scale pan to the delivery apron and from there to the rolls of the lickerin and through the garnett breast to the first cylinder.

Worker and stripper rolls are set close to the cylinder in this first section. The stock combed off the first doffer is delivered to the second cylinder and, after being acted upon by the workers and strippers, is delivered to the second doffer.

The processing at this point departs from the conventional garnetting procedure. The method of cross feeding developed in this plant was designed to improve the cleaning, mixing, and blending of the stock. The sheet of partially paralleled fibers, combed from the second doffer, is conveyed by a lateral conveyor under the doffer to a vertical conveyor and then to a swing distributor that feeds the stock crosswise to the third cylinder. The fibers thus fed are at right angles to the cylinder face.

This right-angle feeding tends to equalize any color, weight, or stock variations across the width of the partially garnetted sheet of fibers. The stock passes from the doffer of the third cylinder to the fourth cylinder and is combed off the fourth doffer and wound into a lap.

The finished garnetted stock in this plant is a uniform blend of stock and color in a well-opened, fibrous condition. The quality of garnetted stock, of course, depends largely on the nature of the material from which it is made. The sorting, selection, mixing, settings, and process controls are also important factors in garnett quality.

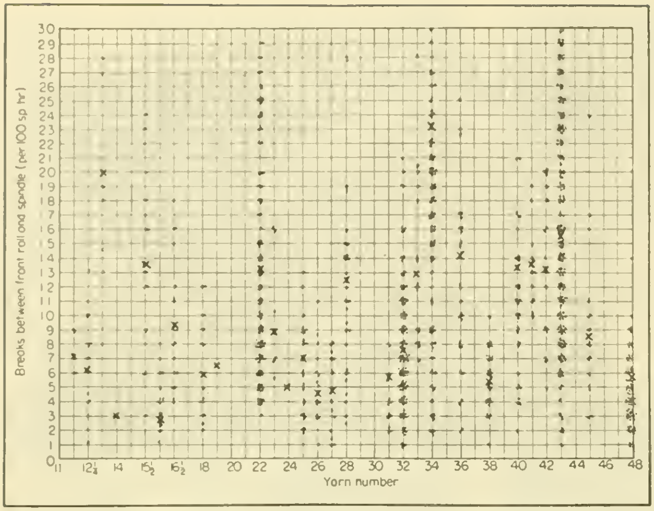
Good garnetted stock is often better than some types of inferior virgin wools.

Transformed by Garnetting . . . . . .

SORTED AND OILED—the stock looks like a mass of worthless rags. Careful handling will make an end product superior to some grades of virgin wool.

PARTIALLY SHREDDED AND OPENED—the original stock can no longer be recognized. Practically all semblance of fabric is gone; you can distinguish only yarn.

FINISHED PRODUCT—the garnetted stock is a fleecy, well-blended product that is uniform in color, has good fiber length, and will spin well.



CATEGORIES from the analysis sheet that prove to be in the same grouping are plotted on a graph for isolated study. Each dot is the average of many individual observations, and each X is the average of the dots. A composite graph of this graph and the graphs of other break areas clearly shows that the area shown above is the major break area.

Summary of Sample Study

Type of Break	Percentage of Total Breaks
Roller lap	
Top roll	18.3
Bottom roll	36.5
At pigtail	6.0
Tangled ends	8.7
Nonpieced rovings	2.4
Roving run out	20.3
Faulty roving (slub)	1.2
Ripped bobbin	0.7
Startup after doff	3.6
Break at large dia. of bobbin	0.7
Broken traveler	0.4
Broken band	0.4
Run off side of roll	0.8
Total	100.00

ENDS-DOWN CAUSES are broken down into as much detail as possible for analysis. This summary from the analysis sheet represents hundreds of observations with different yarn numbers, qualities, travelers, and turns per inch. The analysis sheet shows the individual figures for each yarn study for detailed analysis. The summary points out some obvious mechanical defects.

ENDS-DOWN STUDIES Pinpoint Worsted Spinning Troubles

▶ **If you know why ends come down, you can locate the source of machine trouble or recognize the trouble as a bad blend. Here is a simple study that can serve as a general guide to the breakdown and analysis of ends-down data.**

By M. J. KOROSKYS, Assistant Professor, Wool Department, Lowell Textile Institute

Ends-down studies provide data that can be used to improve the efficiency and quality of worsted spinning. Broken down into detail, the data reveal sources of breakage and the percentage contribution of each source. The cost of bringing sources of excessive breakage into line can be weighed against the expected increase in efficiency. Here is a sample study that can be used as a general guide to the breakdown of elements and the interpretation of the data.

Use Analysis Sheet and Graphs

Ends-down data are the result of hundreds of individual observational studies. The results of the observations in this study were compiled on an analysis sheet by yarn number, quality, turns per inch, and traveler against the sources of breakage. These sources of breakage should be broken down into as many categories as possible. Large and general groupings create doubt when you try to translate the data into specific corrections of spinning troubles. This procedure will seem like more work in the beginning, but it will prove easier in the long run.

After the analysis sheet was studied in detail, specific parts of the sheet were summarized on graph paper. The breaks were compiled into three categories to determine the breaks per 100 spindles per hour, and where and why they occurred.

The three categories selected were "breaks between supply and front roll," "breaks between front roll and spindle," and "roving not pieced up in drawing." Separate graphs of the three categories were plotted for clarity and study; then a composite was plotted to show the relative importance of the categories. The graphs show that the major break area is between the front roll and the spindle and that the other two categories are minor.

The analysis sheet is the result of hundreds of ends-down studies; the graphs are pictorial summaries of specific parts of the analysis sheet. For instance, the analysis sheet shows breaks for a particular stock using different travelers; the plot on the graph would be for a selected traveler. Several categories on the analysis sheet,

for instance "break at pigtail" and "double spinning," are included as a break between front roll and spindle on the chart. Remember that numbers on the analysis sheet and the graph might appear to represent the same break area if the procedure is not made clear in the category names.

The Analysis of Results

Quality. The quality of the wool used is usually fixed by price, by characteristics desired in the finished yarn, or by a combination of these factors. Unless the wool is defective or you are approaching a limit spin, not much is usually done with the quality.

Yarn Number. The specified yarn number usually must be held; however, spinning difficulties are sometimes traced to roving that has become lighter, and the frame spins a lighter yarn number than is desired.

Traveler. Here much can be done. A traveler that is too light will cause poorly wound packages, which in turn will cause breaks. A traveler that is too heavy actually will break the yarn. Too long a time between oilings will vary the traveler drag enough to cause excessive breakage, and so make lint and waste on the traveler.

Corrective Action

The summary of the analysis sheet points out some obviously mechanical defects in the equipment. For highest efficiency, the equipment has to be in top condition. However, under the pressure of production, things are let slide; in fact, the commonplace is seldom recognized until its importance is brought out by a study that pinpoints the trouble and tells you how much of your total trouble is caused by this so-called little item.

Breaks at Roller. This category is swelled by observer inefficiency in not noticing the original cause of the break and catching it only when it has started to lap on the roll. However, repeated offenders should be checked for mechanical faults, bad cover, nicks on roll, etc.

Breaks at the Pigtail. May be caused by too little tension on ends, spindle off center, rough spots, etc.

Tangled Ends. May require protective shields. There may be cross currents of air from windows; also, traveler might be too light, etc.

Drawing-Room Faults. Roving packages should be of uniform size and planned to run out at the doff. The drawing room should attempt to keep breaks at a minimum and quality as high as possible. A study will show how much spinning trouble is actually the drawing room's fault.

Ripped Bobbins. Attempting to get a larger package by building too large a bobbin results in the traveler catching the bobbin and cutting into it. The same thing will occur when the spindle is off center or vibrating. Breaks at the large diameter of the bobbin also are caused by these factors.

Broken Traveler. Caused by defective traveler, ring, lack of lubrication, slubs, or a combination of these or other causes.

Broken Bands. Periodic inspection and protective maintenance will help here.

End Runs Off Side of Roller. Off-center guide fingers will cause this trouble.

Some of the specific recommendations resulting from this study were:

1. Install full-length separators to prevent double spinning.
2. Center the spindle properly and make a proper-size bobbin to prevent the traveler from cutting the yarn.
3. Select the proper size of traveler for each yarn for the best spin.
4. Sweeten the blends that give inherently poor spins.

Rotating Separators Clean Woolen Mill Waste

TWO 48-IN. SEPARATORS screen a total of 800 gals. per min. of woolen waste water that contains 5% solids and must be clean enough for a new city sewage system.

City officials in Lebanon, Tenn., put in a new sewage system; and Lebanon Woolen Mills had to make sure that its waste water was acceptable.

Solids in the waste water included linters, detergent chemicals, and "eyebrows" (short hairs from the legs and shanks of sheep). The eyebrows, which were tapered in shape and measured 0.0034 in. in diameter at the large end, had caused one fine-mesh screen to get clogged.

Two separators from Southwestern Engineering Co. solved the problem. The 48-in.-dia. units have two discharge spouts apiece, and each screens 400 gals. per min. of waste water. The 80-mesh screen cloths have 0.0070-in. openings.

The two units operate on a 24-hr. schedule. One unit accepts the load if the other is stopped; so screening is continuous.

City officials said it was all right to let the eyebrows through if all other solids were removed. Solids make up 5% of Lebanon's waste water. Pure wool balls up on the screen and is thrown out the top discharge spout.

Use Glauber's Salt To Eliminate Harsh Feel

Technical Editor:

What can we do about a harsh feel that we are getting on fabrics of a cotton-wool blend? (9802)

Try using a cationic softener. If you're using common salt, switch to Glauber's salt and try a longer dyeing cycle.

An acid dye has a tendency to give a softer handle than an alkaline dye. Keep pH down to 8; a pH of 9 is too high.

Don't boil. Keep the temperature at 190 to 200° F., and cool 20 mins. to sample.

Put 0.1 to 0.2% anionic in rinse water before the dyeing process; it will act as a wetting agent. Although you may get suds, you will get no precipitation.

What You Need for This Control-Testing Laboratory

A small air-conditioned room will suffice as a laboratory for control testing. The outlay involves very little major equipment and should pay for itself in a short time when the product must meet certain standards.

For the tests mentioned in this article, the following equipment and materials are needed:

Fadeometer	Distilled water	Hot plate
Abrader (Taber or Stoll)	Mason jars	Beakers, assorted
Centrifuge	Thermometers	Clamps
Conditioning oven	Graduated cylinder	Weights, 27 lb.
	Multifiber test fabric	

Careful Dyeing, Finishing, and Testing Reduce Rejects of AUTO FABRICS

▶ **A New England mill found its rejects of auto-body cloths and upholstery fabrics too high.**

▶ **Careful dyestuff selection and altered finishing practices, plus a few simple laboratory tests, brought the goods up to quality.**

▶ **The tests given here are not standard, but they have served the mill's purpose of forestalling rejections.**

By S. E. MIRGH

PROCUREMENT OFFICERS of the larger automobile companies are becoming more conscious of the need for careful control of the physical and chemical properties of the fabrics they buy for auto-body cloths and upholstery. They know what constitutes good end-use characteristics.

Mills must be reasonably sure that each shipment of cloth will pass inspection. Since every other part of a modern automobile is subjected to strenuous testing programs, it is logical to expect certain specified minimum criteria of the fabrics used.

A New England mill that makes a lot of cloth for use in automobiles found that tighter control over the quality of its fabrics was necessary. Rejects were running so high that the automobile fabrics were not profitable.

The following tests were devised by the mill or adapted from standard tests to meets its needs. They were part of the tightening-up program that reduced rejects and turned loss into profit.

Wetfastness

In addition to fastness to wet rubbing, the upholstery should not contain any excess of water-soluble color that would stain a garment if the cushion or the garment were soaked in a shower. The finish should be such that its appearance will not be materially altered if the upholstery is rained on.

Sometimes fastness to perspiration is required. However, if an auto fabric is fast to acid perspiration and alkaline perspiration, it should be practically foolproof to any set of wet conditions that could arise in normal use.

Three of the tests specified for water fastness are as follows:

—Spotting

The fabric must show no signs of permanent spotting after a small area of its surface has been wetted with water at room temperature and allowed to dry. Color change or roughing of surface finish are both objectionable.

—Bleeding

A 4x4-in. sample of the fabric is shaken in 200 c.c. of distilled water in a closed bottle or preserve jar at room temperature for 1 min. There should be only slight, or no, discoloration of the water.

—Staining

Place a 2x6-in. sample of the fabric to be tested face to face with a piece of multifiber test fabric of the same size.

Immerse these pieces in 200 ml. of distilled water in a 250-ml. beaker at 100° F. and thoroughly wet out.

Roll the two swatches together firmly and tie them with a piece of white yarn so that they will not become unrolled.

Place this roll in the beaker of distilled water again. Place the beaker with water and immersed sample in an oven at 175° F. and allow to remain there for 2 hr.

Remove, squeeze, and allow to dry in air. Compare the multifiber fabric with the original for staining, and compare the shade of the sample to the original swatch. Staining and color change must be no greater than the specified limits.

Lightfastness

For all practical purposes, the Fadeometer is an adequate instrument for testing lightfastness. A fabric that shows no fade after 25 hr. in a standard FDA-R type of Fadeometer and that shows a moderate amount of fading after a 50-hr. exposure should be of adequate lightfastness to meet the life-expectancy requirements of the normal car. A fade "on tone" is far less objectionable than a fade to a tone radically different from the original shade.

Stretch and Set

A relatively new specification is referred to as stretch and set. This requirement has been set forth by only one procurement office to date. It is an attempt to determine how much the fabric will stretch, both warpwise

and fillingwise, and how much of that stretch will be permanent. The test method is probably tentative and may be subject to further refinements.

—Stretch

Cut a sample of the fabric 3x9 in., and mark off a 3-in. section across the center of the sample. Clamp a 27-lb. weight to one end of the sample, and suspend the weight vertically for 10 min. Measure the increase in length of the 3-in. section while the weight is still attached, and calculate the percentage of stretch.

—Set

Remove the 27-lb. weight, and allow the sample to recover in a horizontal position for 10 min. Measure the increase in length of the 3-in. section, and calculate the percentage of set.

This test is conducted in a standard conditioned laboratory at 70° F. and 65% r.h. Results must be within specified limits.

Abrasion

Abrasion testing of fabrics in general is a much-discussed and debatable subject. Many testing devices are available. The degree to which tests made on any of these various pieces of equipment may be correlated to actual wear conditions still awaits further comparisons and experience. For the time being, many automobile specifications call for 1,000 cycles of abrasion on a Taber Abrader with 1,000-gram weights and CS-10 abrading wheels.

Shrinkage

Shrinkage of an automobile fabric due to wetting, of course, would be an objectionable feature, especially if shrinkage were excessive. Requirements usually call for shrinkages not to exceed 7 to 9%. One test method is as follows:

Mark off a 10x10-in. test specimen on an 11x11-in. test sample, and immerse the sample in clean tap water (70° F ± 2° F.) until thoroughly wet out. Avoid wrinkling or stretching. Centrifuge (do not wring or twist) to remove as much water as possible. Lay out on a smooth, flat surface and let dry in standard atmosphere of 70° F ± 2° F. and a relative humidity of 65% ± 2%. When dry, remeasure the sample and compute the percentage of shrinkage. Limits are specified for each type of fabric.

Finishing Automobile Fabrics

A great many of these fabrics are flat-finished goods. Finishing procedures are not complicated. Some of the soft-faced goods are given a light napping and are brushed, sheared, and pressed. The clear-finish goods are generally only brushed, sheared, and pressed. Where excessive shrinkage is encountered, adequate preautions must be taken in the drying to stabilize the goods.

Excessive stretching fillingwise on the tenterpins will naturally result in excessive filling shrinkage. Excessive tensions in the dryer are easily overcome by the use of an overfeed. Stretching warpwise due to pressing is a common cause of excessive shrinkage in the warp. This fault may be overcome by eliminating the pressing, substituting decating or semidecating.

Designers who have been accustomed to laying out woolen goods must exercise imagination and caution in laying out automobile fabrics that have a high percentage of synthetic fibers and yarns. These fibers do not felt in the fulling operation, as do woolens. Therefore, they do not shrink as much in fulling. The fabric must be laid out more compactly in the loom. Excessive fulling of fabrics that contain blends of wool and synthetics is more apt to wear out the wool than it is to felt up the fabric.

Dyeing Procedure

Every combination of synthetic and natural fibers calls for ingenuity in arriving at techniques that will produce the desired results. Frequently, by adequate laboratory experimentation, it is possible to piece-dye a wide range of combinations of blends of synthetics, or synthetic and natural fibers, which at first consideration might be considered as dyeable only through stock dyeing of the individual fibers.

Combinations of wool and rayon or cotton may be piece-dyed with a combination of direct-dyeing wool colors and fast-to-light, direct-dyeing cotton colors as a union. This method requires temperatures approaching the boiling point in order to fasten the color securely on the wool. After half an hour at this high temperature, the bath is cooled to 180°F. to allow the rayon or cotton dyes to exhaust on the fibers.

In a similar manner, combinations of nylon and/or acetate may be piece-dyed in the presence of wool and/or viscose and cotton. Acetate dyestuffs with the direct-dyeing wool colors and the fast-to-light cotton dyestuffs are used. When it is necessary to stock-dye the individual fibers, the usual chrome colors are applied to wool. Vat, direct, or sulfur colors may be used on the cotton or rayon and acetate dyestuffs or nylon and acetate.

Reduce Streaky Dyeing In Worsted Gabardine

Technical Editor:

We've been getting streaks and unevenness in dyeing an all-worsted gabardine. Do you have any suggestions? We prescour, carbonize, and then dye; we scour at 6° twaddle. (9797)

Your trouble perhaps started in spinning, but that doesn't solve your problem.

It's best to use chrome colors with bottom chrome dyeing. Use a longer process before dyeing to soften up thick and thin places.

Neutralizing with soda ash leaves marks because soda ash forms carbon dioxide with the sulfuric acid bath. So carbonize after dyeing.

Acidify with a little formic or acetic acid, and take out to 6.4 to 6.5° twaddle in the scourer. You will never get a full neutral at 6° twaddle.

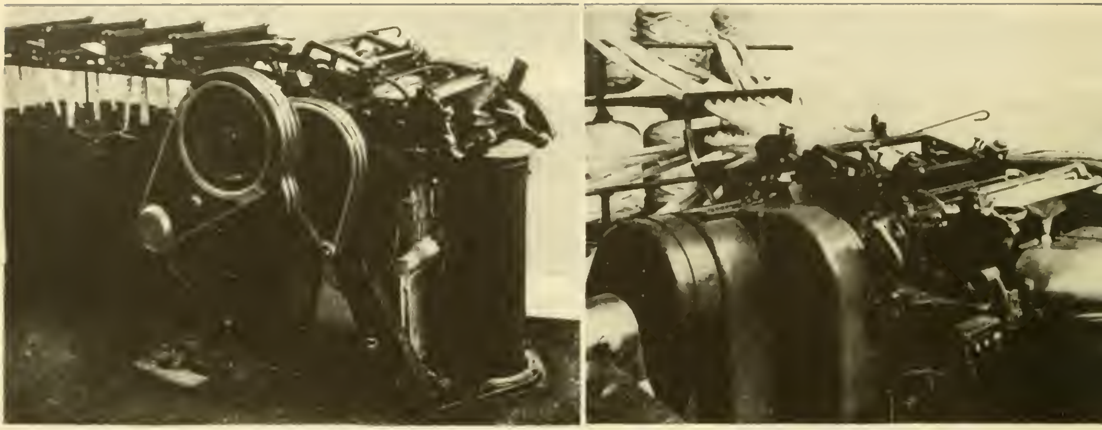
Metallized dyes are second best. With metallized dyes, stay slightly on the acid side. Use 6 to 8% sulfuric acid depending on the number of pieces. Keep the bath at pH 2; or with agents, keep it at 2.6 or 2.7.

The type of material determines when you put in the acid. Some mills put all acid in before the dyes. Use up to 5% glauber's salt with pastel shades.

To neutralize after dyeing, use a little ammonia in the rinse water, but too much ammonia will give streaks.

Another tip is to keep check on your plant water. Plant water varies in pH, and every dyehouse should be pH conscious. One mill that didn't check its water finally located its trouble: the city had doubled the amount of alum it was using in water processing.

Also remember that some of the newer dyehouse chemicals are different chemicals; so be sure not to mix different chemical types.



RECTILINEAR COMBS can be used either with cans or balls in the creel, depending on the type of stock to be processed.

Low Drafts Are Best for Blends on FRENCH COMBS

- Rectilinear combs successfully handle staples of 2½ to 7 in.
- Production—about 16 lb. per hr. on 100% viscose staple—and noilage are lower than are obtained from Noble combs
- When you process uncrimped staple, use cans rather than balls in the creel to prevent splitting, setting of false twist, and undue strain on the pins
- A good humidity condition is 74° F., 62% r.h.

Half-Lap Pinning of a Typical French Comb

	Row	Pin Gauge	Pins per in.		Row	Pin Gauge	Pins per in.
COARSE HALF LAP	1	20	11	FINISHER HALF LAP	10	24	36
	2	20	14		11	24	36
	3	20	16		12	24	38
	4	20	21		13	24	38
	5	22	27		14	26	41
	6	24	32		15	26	41
	7	24	32		16	26	41
	8	24	36		17	26	45
	9	24	36		18	27	52

As a result of the increased interest by cotton spinners in synthetic staples longer than 3 in., and with the advent of various modified systems for processing fine, short-staple wools in blends with synthetics, French or rectilinear combs are coming into greater use. This type of comb successfully handles staples of 2½ to 7 in.

In addition, because of the comb's fine pinning and extensive combing action, blends of man-made fibers, originating from tow-to-staple conversion methods and presented to the French comb in an uncarded state, receive a very desirable blending action.

Production Tips

Compared with the Noble comb, the production of the rectilinear comb is low, about 16 lb. per hr. on 100% viscose staple. At the same time the percentage of noil is considerably lower. But the action of the French comb is such that fine-denier tops are of better quality than similar deniers on the Noble comb.

The humidity conditions necessary

Adapted from the new Second Edition of "Rayon Technology Including Acetate," written by staff members at Textile Research Dept., American Viscose Corp., and published by McGraw-Hill Book Co.

for combing viscose on the French system are no more critical than those necessary for Noble combing. Both operate well at 74° F., 62% r.h.

In general, crimped varied-length viscose staple combs more easily than a uniform-length uncrimped staple. This tendency varies, of course, with the type of man-made fiber being combed.

With uncrimped viscose staple, the use of cans in creeling rather than balls is found desirable. The lack of resiliency of viscose fiber causes balls in the creel to turn soft and fluff off at the bottom. Also, false twist sets in uncrimped rayon sliver when it is on balls; and when the sliver is passing through the comb, undue strain is put on the pins because the false twist will not draft or comb out regularly.

5.5-Den. Crimped Staple

The following illustration is given as a workable layout for 5.5-den. 3½- to 5-in. dull crimped staple that has been picked, carded, and given two preparatory gillings. It should be kept in mind that French-comb pin bars are 14 in. wide.

1. 20 ends are fed from cans at 175 grains per yd. each.
2. The top comb has 56 to 60 pins per in.
3. Pinning is in half lap, as indicated in the accompanying panel.
4. Long-wool cams are recommended.
5. Run 90 to 100 nips per min.
6. Production will be approximately 14 lb. per hr. with a noilage figure of 1.87 to 2.0%.

3.0-Den. Viscose

In going to a finer denier such as 3.0-den. viscose, the pinning in the coarse half lap remains the same. A medium finisher half lap should be sufficient for acceptable combing. Bars would be pinned as follows:

Row	*Pins per Inch*
10	40
11	40
12	45
13	45
14	53
15	58
16	66
17	66
18	66

The pinning on the top comb should be increased to 66 pins per in. Finisher gillings are the same as for 3.0-den. Noble-combed viscose, with the exception that a somewhat lower draft may be necessary in the first finisher operation for the same fiber length. So drafts from 4 to 5 are suggested. And in cases where a short staple is being combed, even these draft figures may have to be reduced.

Tips on How To Prevent Weaving Skips

Technical Editor:

We have been unable to weave our wool lining fabric free of skips and floats. During weaving, the shed opening is not clean and does not allow free passage to the shuttle. Construction details are: 25/2/1 reed, 50-in. reed width, 50x28 ends and picks per inch, four-harness straight draw, and 2/28s cross-bred wool warp and filling. (9648)

Fabrics of this type usually give trouble in both dressing and weaving.

The important part of slashing is to get as much penetration and size content as possible. Some mills get good results with potato or corn starch and others with T-gum. A worsted-type slasher with a double dip of size would probably eliminate this condition. With this type of slasher, the yarn is dipped into the size, passed through part of the dryer, and then is run back into the size for a second dip. You may be able to arrange your present equipment for a double size dip.

Use a high size content, and keep the temperature around 160° F. in the size pan.

The shuttle skips in the fabric can probably be corrected by proper loom settings. These skips are caused by the warp ends sticking together between the harnesses and reed so that the shuttle goes over or under a few threads that do not break clean with the rest of the shed.

Another important consideration is the location of the skips—whether they appear all the way across the fabric or only on one or both sides.

If they are only on the sides and not in the middle, the loom is probably not adjusted properly. The shed should be set to open as much as possible. The cloth should be woven tight, and harness straps should be kept tight, with an even tension on each.

Picking-motion timing is important. An early pick will sometimes cause the shuttle to enter the shed before the shed has time to open properly, particularly if the fabric is almost as wide as the reed space. Harnesses should be leveled so that the bottom shed rests lightly on, or just clears the race plate when the lay is at back center.

Setting the eccentric motion on a C&K head for a fast harness motion may also help to prevent the warp ends from sticking together. The top and bottom harness cylinder gears on a C&K loom may also be secured with adjustable sections that can be adjusted to start the harnesses moving at a different time. This method is one of the best ways to avoid floats and skips on plain weaves.

Ideal conditions for weaving this fabric are by the use of a Knowles head on either a W-3 or a C-4 loom. This head and the throw of the crankarms on these looms give a clean shed. The Knowles-head timing should be made by setting the box motion to a medium, slow, medium setting, which will give a harness setting of fast, medium, slow. This timing will separate the warp ends.

If you're weaving the fabric on any loom other than W-2, W-3, or C-4, your shed opening is probably too small and your crankarm throw is not great enough to clear your shuttle sufficiently. If such is the case, your only alternative is to use a smaller shuttle and reduce the size of your filling package.

Your harness timing, too, will affect the cloth skips. On C or W looms, time the harnesses to cross at 2⅛ in. from the beat of the cloth (front-center position of the lay). [See TW, Sept. '52, p. 93, for an article on the Knowles head motion.]

Simple Tests for Various Fibers That Arrive Blended at the Mill Or That Need Checking During Processing

For acetate . . . . . .

1. Sample thoroughly throughout the bale and card the sample.
2. Dye a small sample with Black GX00.
3. Fiber colored a golden hue is acetate.

For acetate, Vinyon, and dynel . . . . . .

1. Place weighed sample in a beaker and cover with acetone.
2. Stir for 20 min.; remove undissolved portion; wash; bone dry; weigh.
3. Fiber lost percentagewise was acetate, Vinyon, or dynel.

For separating acetate from Vinyon or dynel . . . . . .

1. Cover weighed sample with glacial acetic acid at room temperature.
2. Stir for 5 min.
3. Fiber lost percentagewise was acetate.

For nylon . . . . . .

Test No. 1

1. Place weighed sample in a beaker and cover with refined phenol.
2. Stir for 10 min.; wash; bone dry; weigh.
3. Fiber lost percentagewise was nylon.

Test No. 2

1. Cover weighed sample with 1:1 HCl (dilute conc., specific gravity 1.10) with equal volume of water.
2. Stir for 10 min.; wash with 100 ml. 1:1 HCl followed by excessive washes with water.
3. Neutralize with 2% $NaHCO_3$; wash; bone dry; weigh.
4. Fiber lost percentagewise was nylon.

For wool, hair, or silk . . . . . .

1. Drop weighed sample into boiling solution of KOH (5 grams per 100 ml. of solution).
2. Boil 10 min. (using about 100 ml. of solution for 0.5 gram of sample).
3. The following results may be noticed:
   .. wool, hair, and pure silk dissolve completely.
   ..... Tussah silk is not completely dissolved.
   ..... protein fibers have substantial residues of a slimy gelatinous nature. They should be filtered through a 100-mesh screen, washed thoroughly, and bone dried before weighing.

CHEMICAL TESTING for blend content is done at the cards, in the yarn, and after the fabric has been finished. Waste

Blending and Testing Are Keys To Good WOOL-WASTE Processing

▶ This reprocessed- and reused-wool manufacturer produces excellent-quality merchandise for specific end uses by . . .

. . . carefully controlled fiber mixing

. . . constant testing of blend-component percentages

. . . a continuous machinery-modernization program.

By GUSTAV ZELLNIK, Consulting Editor, TEXTILE WORLD

The manufacture of fabrics containing wool waste is a specialized technique that requires careful control all along the manufacturing process. Success is obtained in the manufacture of fabrics that are accepted and trusted in the trade only by being sure that (1) you start off with the correct blending of fibers needed to produce a good end fabric, (2) your blending fiber percentages don't go haywire during processing, and (3) your yarns and fabrics are of the best quality possible.

A prominent wool-waste fabric mill is doing an excellent job manufacturing good-quality fabrics in just such a manner. The mill has modern high-speed equipment for all processes, including the preparing and processing of rags, clips, and threads. Its average yarn size is 3¼ run.

Rag Picking

Rags, clips, and threads are run through a large Schofield rag picker, and the stock is opened to the extent needed for the blends required. When additional preparatory work is needed, the opened material is run through a two-cylinder breaker card.

The mill also runs nylon clips and threads regularly through the rag picker. Nylon stock is used with low-grade wool stock (when the finished-fabric price makes the use of low-grade wool necessary) in about a 15% ratio by weight so that sufficient body and strength will be obtained in the fabric. The use of nylon also improves carding and spinning and makes them comparable to running medium- or high-grade wool-waste mixtures.

Nylon clips sometimes cause flash fires on the rag picker that fuse the nylon to black-colored specks in the stock. This fusion occurs most with white nylon—almost never with dyed nylon stock.

This mill has solved the flash-fire problem by wetting out and drying all the nylon stock it puts through the rag picker. In addition, the mill slows down the main cylinder and thus reduces the heat generated by high-speed operation.

Stock Dyeing

Regular tests are made on stock that

Reagent	Method of Application	Types of Fibers Tested	Soluble	Insoluble	Partially Soluble
acetone	Room temp.	mixed	acetate, Vinyon, dynel	all other fibers	
glacial acetic	Room temp.	acetate, Vinyon	acetate	Vinyon	
1:1 hydrochloric	Room temp.	mixed	nylon	all other fibers	
5% caustic soda	Boiling	mixed	wool, hairs, cultivated silk	celluloses, nylon, and resin fibers	regenerated proteins, Tussah silk
Conc HCl	Room temp.	protein	cultivated silk	all other fibers	proteins, Tussah silk

Note: Violet color means a casein fiber

losses of types of fibers are thus spotted, and adjustment for final desired percentage results can be made.

is carbonized and raw-stock dyed. Fiber strength is watched closely to see that it is not injured in any way beyond a permissible tolerance. Stock is never allowed to get brittle.

When a blend is to be dyed, stock is packed into a 500-lb.-capacity pressure-dyeing kettle and processed in the usual manner. After dyeing, the stock is lifted out by an overhead hoist and allowed to drain; it is then pulled by rake over a lattice apron to the hopper of the drying range.

The drying range consists of a long continuously moving lattice apron running through heating chambers. Stock is carried to this apron from the hopper by a vertical spiked apron that feeds the stock through squeeze rolls to an opening unit that fluffs out the dyed stock. The stock then moves onto the drying apron.

Preliminary opening up of the stock before drying reduces the steam requirements for drying and increases the speed of drying (and thus the productive efficiency of the dryer).

From the dryer the stock is blown to the baling press. It is then taken to the picker room for immediate processing or is stored in the warehouse for later use.

Blending on the Pickers

At the time of our visit to the mill, a blend of 20% nylon, 25% rayon, and 55% wool and wool waste was running through the picker.

The first batch of the blend was laid out on the lattice apron of the picker; and the material, after going through the picker, was blown into a 10,000-lb.-capacity storage bin. The bin is equipped with a revolving Truslow blending unit operating from the ceiling, and air currents in the bin are minimized by means of an attached baffle. The picker production rate was given as approximately 5,000 lb. per hr.

Waste Wool Can Be Used Advantageously

There are two different kinds of what used to be called "shoddy." Both can be used advantageously in some types of wool fabrics, especially if the stronger types of synthetic-fiber waste stock can also be used to give added fabric qualities as needed.

1. One group is "reprocessed" stock; that is, material that has never been used in clothing. It can be almost as good as virgin wool and sometimes is better than the original fiber.

To the reprocessed group belong lap waste, noils, thread waste, newly woven or knitted clips, etc. There are different types of noils, such as French, Bradford, and Lister. French noils are the shortest in length, then Bradford. Lister noils are the longest-staple noils.

Thread and clip waste have to be opened on a rag picker, shredder, or garnett. Regardless of this material having to be opened up again, it is good stock and entirely adequate for a large number of products.

2. "Reused" stock comes from old rags, old clothes, and other fabrics that have been worn or used. The stock has to undergo certain preparatory processes: disinfecting, washing, drying, and then shredding or rag picking. When hard-twisted yarns are involved, the partially reopened stock has to be run through a garnett to get complete opening.

As reused fibers have neither the staple length nor the length of the original fiber, care has to be observed in specifying how much reused wool goes into a blend. Too much waste wool will make the work run bad and ruin the quality of the finished fabric.

DYED STOCK is pulled out of the dye machine to be dried on a continuous dryer before it is blown to the baling press. It is then taken to the picker room or stored in the warehouse for later use.

PICKER-PROCESSED STOCK IS BLOWN to 10,000-lb.-capacity bins equipped with Truslow blending units. This setup serves as a double-blending operation by means of only one handling through the picker.

Accurate Labeling Is Important

A mill manufacturing with wool waste has to be very careful to observe to the letter the Wool Labeling Act. Not only must the consumer be told what he is getting in a fabric, but also such a mill nowadays is liable to claims from the garment manufacturer.

In short, the fiber content of fabrics produced must be what the label says; and this fact means constant checking during processing so that no hidden fiber losses can creep in.

50-IN.-DIA. DOFFERS on the woolen cards give increased production and turn out quality work. The author is inspecting the doffer's continuous-stripping setup.

After the first blending, the stock is sucked through a pipe to a second picker. After further mixing in this picker, the stock is blown to another storage bin similar to the first one. If the blend is a one-color blend, the stock is blown to a bin located above one of the card hoppers.

If a heather blend is being prepared, the stock gets a third picking, which is also carried out with a minimum of manual handling of the stock. This arrangement means that the stock gets six blendings before it goes to the cards—three on the pickers and three from bin blending.

The picker-room help consists of a foreman and three helpers. They turn out 70,000 lb. per week in a one-shift operation that keeps the card room operating around the clock five days a week.

Carding

On the floor above each card hopper, the mill has built large storage bins, each of which holds about 5,000 lb. of blended stock blown from the picker room.

The funnels leading down to the card hopper one floor below hold about 1,000 lb. each. They can be closed off from the 5,000-lb. storage bin so that, while the final 1,000 lb. of a blend is being run out of the funnel, stock for the new blend can be blown to the larger storage area and gotten ready for carding. Thus,

no time is lost at the cards in changing from one blend to another.

Several of the wool-type cards in the mill have 50-in. doffers. The management likes the higher production obtained from the larger doffers as compared to the 36-in.-dia. doffers. A humidifying system throughout the room keeps all stock running smoothly.

The larger-doffer cards have a continuous-stripping suction-fan arrangement located above each fancy. The attachment keeps the fancy from making bands around the cylinder and other bad work and keeps dust and fly at a minimum in the card room—both important features in the carding of short staples.

No good stock is lost by this continuous stripping arrangement, as the fly obtained is collected in a box at one side of the card and what is still usable is brought back by hand and fed evenly around the stock in the back hopper. Thus, this short-staple stock is evenly redistributed and does not weaken the roving ends at each side of the jack spool at the finisher end of the card.

Maintenance of the cards is on a definite schedule. At least 14 of the 16 cards are kept running continuously, while two of them may be down for checking, grinding, reclothing, or refurbishing. Maintenance is handled by a crew from the machine shop. While the shop men are engaged in the work, they are responsible to the card-room foreman.

Spinning and Weaving

In the spinning room, ring spinning frames, each with 120 spindles, are set up for the time being with a workload of two frames per spinner. Experiments are under way to see if spinners can handle 360 spindles per operator without lowering the quality of the yarn. Frames equipped with Pneumafil are a step in this direction.

Waste collected from the frames is either taken to the card room periodically to be fed back into the appropriate card hopper or is stored for future reuse if the blend is no longer running in the card room.

Static is kept to a minimum in the spinning room by the use of humidifiers and by the careful preparation of the blends in the preceding processes.

In the weave room, all looms are automatic and are equipped with specially arranged beam stands that make from 30 to 34 cuts possible from a single warp.

Boxes and magazines have been enlarged to take a shuttle that holds a 4-oz. bobbin of yarn. Weavers can handle six to eight looms.

CONTINUOUS-STRIPPING ATTACHMENT above the fancy (arrow) eliminates bands and other bad work and keeps lint and fly to a minimum. Waste is deposited in a box and distributed in the hopper by hand to prevent heavy waste content on the ends of the jack spools.

Blending Hints

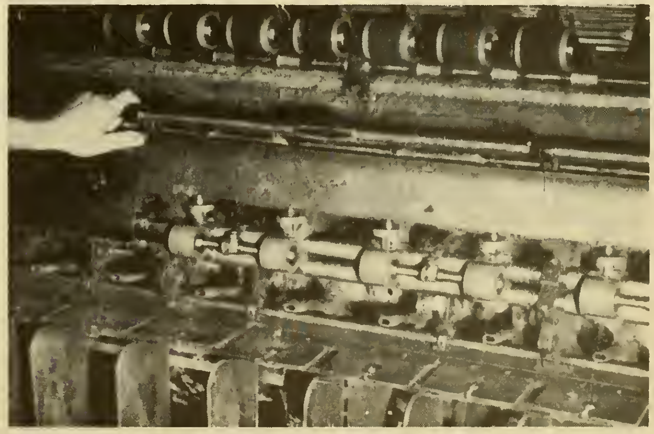
▶ The mill uses a large quantity of short noils in the manufacture of suede cloth.

▶ In the manufacture of covert cloth, the bulk of the blend consists of garnetted worsted threads. Results achieved are far better than those obtained when shorter-staple virgin wool is used.

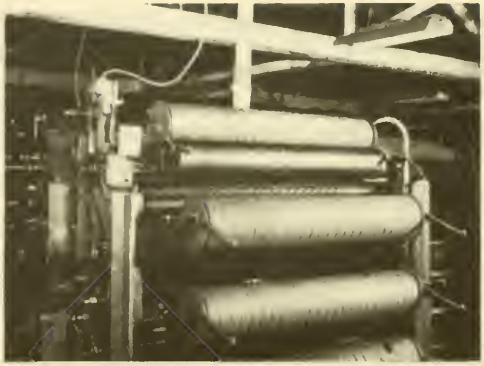
▶ Automobile fabrics made by the mill consist of a blend of 15% nylon, 20% rayon, 40% cotton, and 25% wool (virgin and reprocessed). Staple length of the blend averages between 1½ and 2½ in. The fabrics meet all strength-test requirements.

▶ When static problems are encountered, the mill adds to its emulsion on the picker about 2% of Dianol ANC (Quaker) or Avitex (Du Pont) as an antistatic agent. But blends containing less than 25% nylon do not give static trouble.

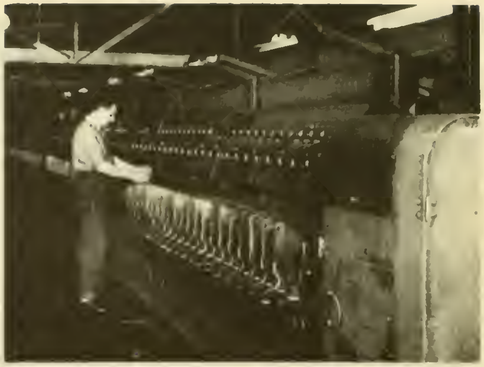
▶ Any blend in the mill containing Orlon has only stock-dyed Orlon in it to avoid the many problems involved in obtaining an even color with Orlon in a piece-dyed blended fabric.



PNEUMAFIL AIR-SUCTION SYSTEM on the wool-type spinning frames prevents many yarn defects and keeps the frames cleaner than frames ordinarily are in a wool-waste mill.



FOUR 24-END SPOOLS wind the 50- to 250-grain roping made on each of the five Whitin cards.



ONE-POUND PACKAGES are spun from jackspools. Dewey Dedman pieces an end on one of the 10 Whitin spinning frames.

END-TO-END CREELING insures almost continuous operation of the two Abbott quillers. Edward A. Robinson tends this quiller.

SPINNING PACKAGES are creeled end-to-end for cone beaming by Carrie Talley and Eveline Knowles.

Blanket Mill Streamlines WOOLEN-YARN Processes

This woolen mill makes only one product—blankets. But to improve overall operations, the old yarn-processing machinery was replaced with new equipment that—

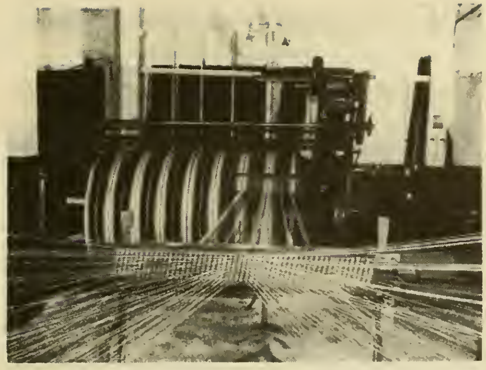
- Makes roving from raw stock in one continuous process
- Quills filling yarn from the spinning package
- Beams warps straight from the spinning package
- Enables weaving without drop wires

By RICHARD B. PRESSLEY, Assistant Editor, TEXTILE WORLD

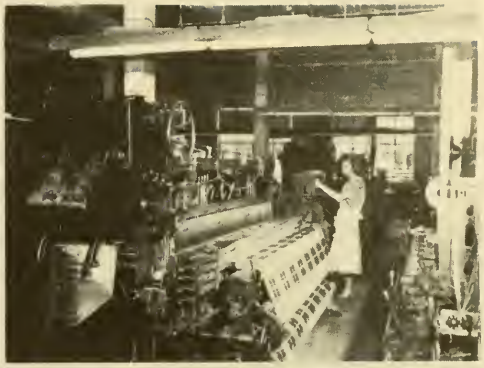
A STREAMLINED yarn-processing system has been established at Lebanon Woolen Mills, Lebanon, Tenn., by the removal of obsolete machinery and the installation of modern machinery that keeps materials moving forward all the time.

Because of the changes, warp and filling yarns are made with few processes, and the yarns are woven with fewer loom breaks per hour.

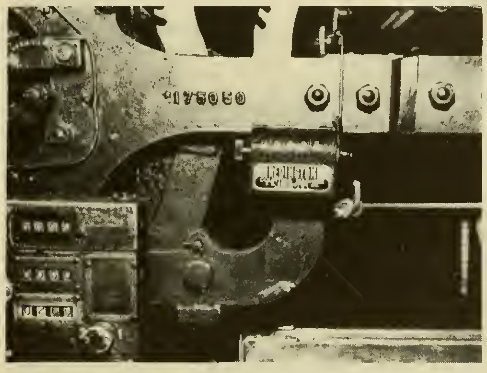
Results obtained from the new processes are higher-quality cloth and higher weave-room efficiency.



THE CONE-CREELING EQUIPMENT was designed by Lebanon Woolen Mills. The full cone is moved down the track for beaming.



A SCOTCH-PLAID BLANKET is being woven on a W-3 automatic loom equipped with a multiplier. Helen Trammell fills the magazine.



THE COUNTER is connected to a head jock. When a complete blanket is woven, the jack rises and the blanket is counted.

WASTE YARN is removed from exhausted filling bobbins by this belt-driven reel turned by the crankshaft.

Carding and Spinning Feature Large Packages

Wool is usually bought already scoured and is pressure dyed when Scotch-plaid blankets are to be woven. When blankets are to be finished in solid colors, gray stock is used.

Blends are laid out on the floor behind two Curtis & Marble pickers in tandem. Opened and mixed stock is then blown to bins above the five cards. The cards, which are hand fed, are 60x60's equipped with Model E automatic feeds, Model T-1 intermediate conveyors, and Model K4DB double-rub tape condensers that deliver to four 24-end spools.

The roping weights range from 50 grains for light yarns to 250 grs. for heavy yarns.

Jackspools are taken from the condensers to 10 Model E wool spinning frames directly at the ends of the condensers. Each of the frames has 120 spindles of 6½-in. gauge and 5-in. rings.

Drafts used are from 1.30 to 1.40.

Spinning packages average 1 lb. each. Since the packages are 10 times larger than those available from the mule spinning frames removed, knots in the yarn have been reduced to a tenth of the former number.

In addition, the breaking strength of the spun yarn has been increased. Doffing has been reduced by 90%, and there is less yarn handling.

Carding equipment is both Whitin and Davis & Furber. Spinning machinery is all Whitin.

Quilling and Beaming Skip a Process

Doffed packages of spun yarn to be used for filling are moved to two Abbott quillers near the spinning frames. Each of the quillers has 30 units.

Only one color or size of yarn is run on a quiller at one time. The operator creels new bobbins of yarn to the tails of the bobbins being run so that no unit ever runs completely empty of yarn.

When yarn colors or sizes are to be changed on a quiller, the creels are run out and the quiller is blown off with compressed air and completely cleaned.

Warp yarns are taken from the spinning frames to the beamer room on the floor directly below the Abbott quillers, where they're beamed on a cone-type reel.

All the equipment in the beamer room was designed and made in Lebanon's own plant. The creel was used on the old beaming system but has been reworked to hold two adjacent spinning bobbins so that the second bobbin can be creeled to the bobbin

being exhausted in the same manner in which the Abbott quillers are creeled.

Almost continuous creeling is necessary, but a winding operation has been eliminated.

Each warp end goes through two stop motions to insure a quick stop when an end breaks.

The warp is run on a reel mounted on a carriage. When the reel is filled with yarn, the carriage is moved along a track to a pressure beamer. While the yarn on the reel is being transferred to a loom beam, a second reel on a second carriage is being filled from the creel.

Multicolor warps can be beamed as easily as plain-color warps; and since the length of warps is controlled by the creel, waste yarn is reduced.

Warps Are Not Dressed, and Drop Wires Are Not Used

Warps are so strong that they do not have to be dressed to weave at a high production figure.

Warps are not tied back when they run out at the loom but are cut out. Each new warp is drawn in by hand in the beamer room.

The weave room is next to the beamer room; and, again, materials have to be moved only a short distance to the next process.

Lebanon does not use drop wires on the warps in the looms. Wool stock of good quality, well-processed yarns, looms frequently patrolled by the weavers and well-trained burlers make stop motions unnecessary for most of Lebanon's blankets.

The saving in time for tying on new warps without drop wires over the time required to tie on warps with drop wires more than offsets any disadvantages that occur from the lack of warp stop motions.

Quality- and production-control practices used in most well-organized weave rooms are used at Lebanon. For example, a production sheet is posted each 24 hrs. to show the efficiency and seconds of each loom, weaver, and loomfixer on each shift.

Each cut of cloth contains 20 to 30 complete blankets. The 36 automatic looms produce approximately 40,000 finished pounds per week.

The blankets are inspected and burled in the weave room near the looms. Weavers and loomfixers are shown faulty cloth soon after it's inspected so that errors can be corrected immediately.

The finishing plant is located next to the weave room. Blankets are washed, carbonized, napped, dyed, bound, inspected, and boxed in the finishing plant.

The Machinery Is Stopped Ten Minutes on Each Shift

Raw stock is received at the same shipping point used to ship finished blankets. The raw stock, in a complete round of processing, goes up an elevator, straight through the second floor of the building, down an elevator at the end, and back through the first floor of the building to the shipping point. Materials do not backtrack at any process in the manufacture of the blankets.

An interesting feature of Lebanon's manufacturing program is that, in addition to regular rest periods, the machinery of the entire plant is completely stopped for 10 mins. on each shift. The stop takes place at about the middle of each shift, and only one department is stopped at a time.

During the time the machinery is stopped, the employees are urged to get completely away from their jobs and relax. Immediately following the beginning of this practice, mill production increased and has continued to hold the increase.

Kinks and Short-Cuts

Large Handwheel on Head Motion Helps Weaver Move Harnesses

LARGE HANDWHEEL permits the weaver to pull back the lay or change harnesses to remove broken picks by hand with little physical effort.

Many of the fabrics we weave on our C&K W-3 pick-and-pick looms require 25 harnesses. On weaves of this type, our weavers find it hard to move the head motion by hand when they are leveling the harnesses or taking out broken picks.

We installed a larger handwheel to make it easy for the weaver to move the harnesses. The handwheel is made from a metal handwheel taken from the crankshaft of a W-3 loom.

The center of the handwheel is machined out to fit a 2-in. sleeve. The sleeve is 5 ins. long and is keyed to the handwheel and fastened with a setscrew.

The other end of the sleeve is drilled to fit over the end of the top cylinder ($1\frac{1}{16}$-in. hole) in place of the regular handwheel. A setscrew holds the sleeve to the top cylinder.

We bored a $\frac{3}{8}$-in. hole in the outside rim of the handwheel to hold a handle.

The handle is made from hardwood and is turned on a lathe to the same general shape of the handle on a regular handwheel. The finished handle is 4 ins. long and $1\frac{1}{2}$ ins. in diameter. A $\frac{13}{32}$-in. hole is drilled through the center of the handle. The handle turns on a $\frac{3}{8}$-in. bolt that fastens it to the handwheel.

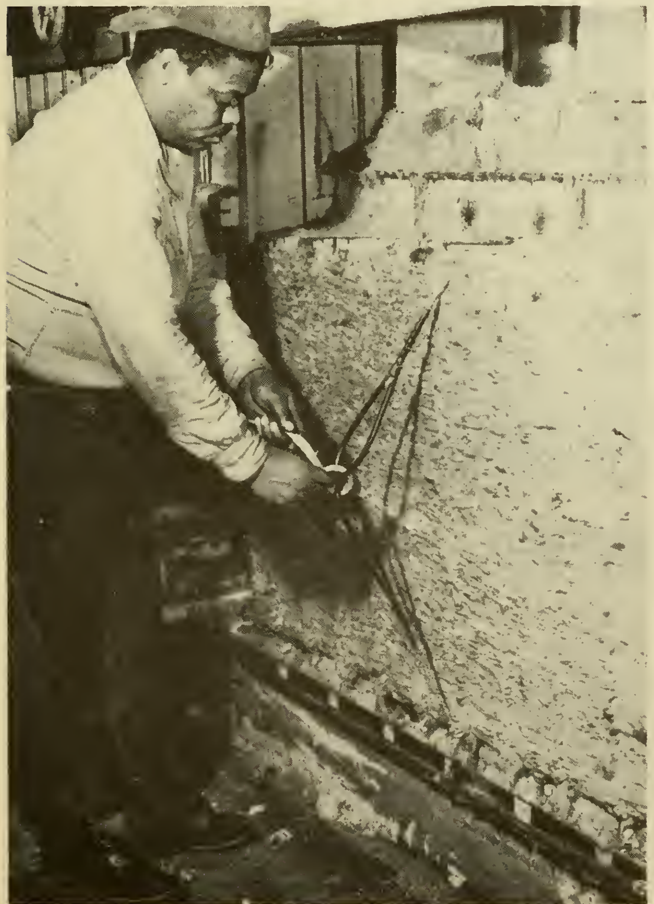
The old handwheel was $12\frac{1}{2}$ ins. in diameter; the new one is 20 ins. Since the new handwheel has greater leverage, the weaver has to use less effort when he turns the harness by hand. *Leslie D. Hayter, Huntingdon, P. Q.*

Reusable Bands Cut WOOL-BALING Costs

▶ A tandem baling press and permanent, easily handled rope bands and loops are enabling a Northern mill to make significant savings in raw-wool handling

▶ Savings include—

- Less storage space needed
- Metallic baling-tie losses avoided
- Direct labor cost reduced 4 to 6¢ per pound



ONLY EXPENDABLE ITEM in the new baling system is a foot or so of rope per band. Reusable manila loops and disposable rope ties are used instead of flat metallic bands that formerly were cut when a bale was opened and then had to be disposed of.

By SEYMOUR RAPPAPORT
Gluckin Corp.

A RAW-WOOL BALING TECHNIQUE in which permanent bale bands and loops are used over and over has saved a Northern mill over $64,000 in direct labor, over $10,000 in material cost, and $25,000 in overhead expenses since its installation two years ago. Additional savings have been realized in storage space requirements, handling, improved separation of lots, and more accurate weighings.

The mill has cut down on the storing of loose wool in bins and has saved on its bale-tying expenses at the same time.

Secret of the space-, time-, and money-saving method of wool handling is a tandem bale press. The press is fed from an overhead blowing system and forms 550-lb., 53x28x 45-in. bales. A single fork-lift truck with a clamp attachment handles three of these bales at a time. Reusable manila-rope bands with small, disposable manila-rope joiners hold the bales together.

The rope joiners are tied with a simple square knot. To use the smallest amount of rope possible, the free end of the coil is passed through the permanent-band loops and the knot made. The rope is then cut as close to the knot as is safe, considering the slippage requirements.

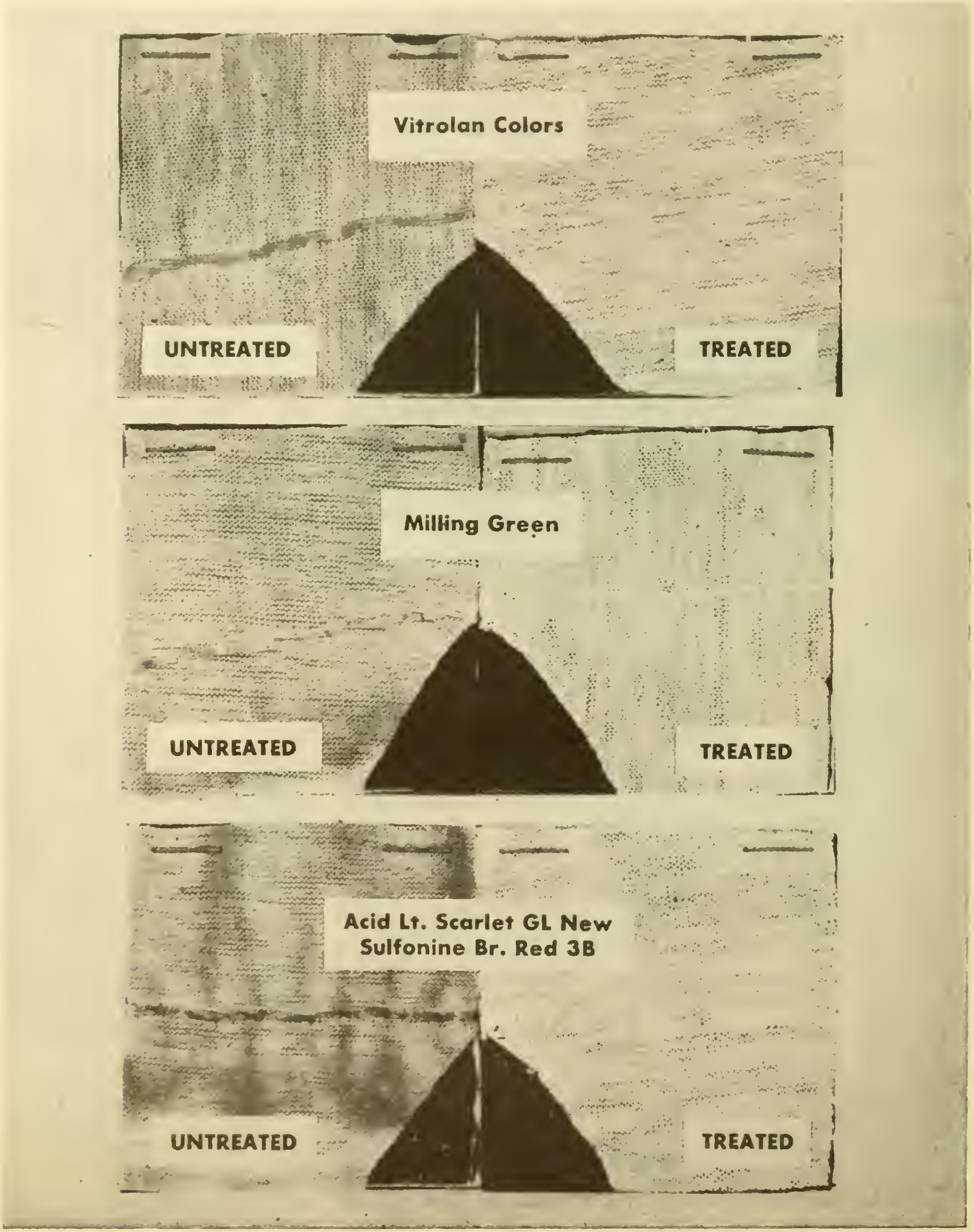
The band-fixing time needed while the bale is under pressure is no longer than that required for placing flat banding strips or wire ties, and opening consists merely of cutting the disposable joiners with a knife.

The operator who delivers the bale for processing returns the manila bands to the baler for reuse.

Manila ropes cost only $1.30 each. Strength, stretch, safety, and ease of handling are all good. The manila bands last about a year.

The over-all material costs of baling are low now—$3,400 per year instead of $15,000. The $3,400 includes the cost of the permanent manila ropes and the disposable joiners.

The savings made by the new technique become even more important when you consider that the same wool is often baled three or four times in its loose form.



AIR-DRIED SAMPLES look like this after 15 minutes washing at 120° F. The white knit material is Orlon. The samples at right were after-treated with Chromofix.

For Washable Woolens— Make Your COLORS WASHABLE

▶ Chromofix, an organic chrome complex easily applied to carefully selected dyes, is said to improve fastness of woolens to washing, fulling, and perspiration.

By GEORGE M. MOISSON
Assistant Editor, TEXTILE WORLD

A NEED FOR WASHABLE COLORS has arisen out of the increasing use of shrinkage-control processes on wool fabrics.

Some of the commonly used dyes are sufficiently fast to washing for use without aftertreatment, but only an extremely narrow range of shades can be obtained with such colors.

To enlarge the range of shades and make available some bright, heavy shades for shirting, socks, and suitings, Sandoz Chemical Works, Inc., has developed a product called Chromofix B.

Garments that are washed in commercial establishments and then dried at high temperatures in a minimum of time may not show any staining of the adjacent white areas. However, if these same garments are washed either in a machine or by hand and then hung to dry in the air, migration of the color is particularly bad where dyed wool is adjacent to undyed Orlon, nylon, or Dacron. The hydrophobic fibers dry more quickly and tend to draw moisture and color from the dyed wool by capillary action.

What Chromofix Does

The new product has been in use for a short time in several of the dyehouses that are treating woolens with shrinkage-control processes. Several mill-dyed samples are shown on the opposite page before and after being treated. The samples were hand squeezed and allowed to dry. Migration is pronounced on the untreated goods.

No detrimental influence has been found on lightfastness of the treated colors; however, there is a considerable shade change on some colors. Another effect caused by Chromofix, which might be considered beneficial, is that treated wool has less tendency to felt.

Here's How It Upgrades Dyes

The soluble chromium salts in Chromofix are stable until exposed to heat in aqueous solution. Under the effect of heat, the salts combine with the dyestuff molecules attached to the fiber. The resulting larger dyestuff molecule is thus rendered less soluble and much faster to wet processing as shown in the tests (opposite page).

A number of dyestuffs were tested on wool, with and without Chromofix, and compared. The dyes were representative of the most popular types available from most dyestuffs manufacturers.

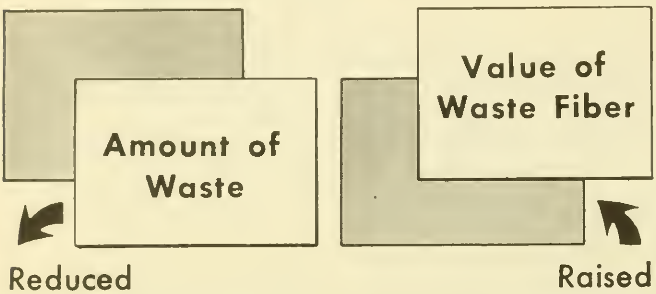
The method of treatment is simple. After dyeing and rinsing, the goods are treated with 3 to 5 lbs. of Chromofix B per 100 gals. of water. The previously dissolved Chromofix is added to the cold bath and temperature is raised over 20 mins. to 175° F. and maintained at 175 to 180° F. for 10 mins. The bath is then dropped; goods are rinsed and dried in the normal manner.

A list of the tested dyes follows. Shade change and improvement in fastness to washing and to milling are noted.

Dyestuff	Effect on Shade	Improvement: wash-fastness	Improvement: milling fastness
Xylene Milling Red B	duller	1 point	1 point
Acid Milling Red R	duller	2 points	2 points
Sulphonine Red 3B	slightly duller	1 point	2 points
Sulphonine Brilliant Red BG	slightly duller	2 points	2 points
Sulphonine Brilliant Red 6B	slightly duller	1 point	1 point
Sulphonine Scarlet GWL	duller	already good	1 point
Acid Lt. Scarlet GL	duller	1 point	2 points
Sulphonine Red G	duller	already good	2 points
Sulphonine Red RS	duller	approx. 1 pt.	2 points
Xylene Fast Violet R	little change	2 points	1 point
Fast Sulphon Violet 5BS	little change	1 point	1 point
Acid Violet 4BNS	little change	1 point	1 point
Acid Violet ACS	little change	1 point	1 point
Xylene Fast Blue GL	—	2 points	1 point
Xylene Fast Blue FF	—	2 points	1 point
Brilliant Alizarine Milling Blue G	—	already good	1 point
Brilliant Alizarine Milling Blue BL	—	1-2 points	1 point
Sulphone Acid Blue R	—	1-2 points	1 point
Sulphonine Blue 5R extra	—	1 point	1 point
Brilliant Alizarine Milling Blue F2GL	—	1 point	1 point
Brilliant Alizarine Milling Blue FGL	—	1 point	1 point
Xylene Fast Green B	—	1-2 points	1 point
Xylene Fast Green 6B	—	1-2 points	1 point
Alizarine Milling Green B	—	already good	1 point
Alizarine Light Green GS	—	approx. 2 pts.	1 point
Alizarine Light Green BT	—	approx. 2 pts.	1 point
Sulphonine Red Brown V	—	1-2 points	1 point
Alizarine Light Brown BL	—	1-2 points	1 point
Alizarine Light Grey RLL	little change	1 point	1 point

This Weave-Room Waste Check-up Reduced LOSS OF WOOL

When a woolen mill found its weave-room waste almost double a neighboring mill's, it decided to do something about it. After laboratory analyses to find out just what the waste was, this is what happened in the mill—



By MICHAEL J. KOROSKYS
Assistant Professor, Wool Dept., Lowell Technological Institute

A New England woolen mill recently set out to do something about its weave-room waste. Waste in that department was running an average of 1.60% of total cloth production in comparison with a neighboring mill's 0.97%. A breakdown of the waste into three classifications showed these comparisons:

Waste	Mill A	Mill B
Hard ends	0.59%	0.62%
Thrums	0.58	0.08
Sweepings	0.43	0.27
Total	1.60%	0.97%

Since Mill A's records covered 3,065,555 lbs. of woven cloth, the 1.60% waste represented a loss of almost 50,000 lbs. of high-priced cloth.

The first step in the mill's fight on waste was to find out just what the waste was. The practice was to weigh and record the various types of waste and calculate the scale weights as percentages of the cloth produced. Laboratory analyses showed that a surprising amount of the waste was foreign matter rather than wool.

One representative test, which covered waste from a complete loom warp, showed these percentages of waste:

Grease and oil	56.0%
Dirt and size	12.2
Wool (dry)	30.0
Unaccounted for	1.8
Total	100.0%

Although the mill learned by these analyses that only 30% of its waste was wool fiber, that percentage represented 14,714 lbs. of actual fiber lost.

The second step in the mill's new waste program was to study the processes where waste was made to see what could be done to reduce it. It now knew that over half its waste was foreign matter rather than wool, almost a third of it good wool. So waste reduction became a problem of reducing oil and waste wool.

The warper room, slasher room, and weave room were studied for waste of filling yarn and warp yarn. Some causes of waste and preventive measures the mill adopted were:

1. Filling Yarns

a. Battery

In pulling yarn off the quill at the loom to place the quill in the battery or magazine, some weavers pulled off much more yarn than others. Weavers were cautioned not to pull off more yarn than is absolutely necessary. One yard of excess waste pulled off each quill of filling that went into a warp meant a loss of approximately 3,000 yds. of yarn.

b. Tails

Quill bunches were set for approximately 12 yds. of filling on each used-up bobbin at the transfer on Baker looms and 8 yds. on all other looms.

c. Yarn from breaks, etc.

This yarn frequently falls to the floor and is picked up as sweepings. Sorting was increased and the value of the salvage waste was lowered.

d. Bad winding

Often bobbins that had been incorrectly wound were stripped and thrown into waste. A routine was set up whereby these bobbins were returned to the winder room for possible rewinding. A high percentage of them was salvaged.

2. Warp Yarns

a. Yarn cut off dresser spools

Warpers and dressers run as much yarn as practical off the spools, and the remaining yarn is cut off and put into waste. The smaller the amount of yarn on the full spools, the greater the proportion that goes into waste as tails. Cooperation of the spooling and twisting department reduced the number of short doffs and decreased tailing waste.

b. Bitten yarn cut off at slashers

When the slasher tender starts a new set through the slasher, he cuts off the end of the new warp sheet to eliminate crossed ends. It was found that in many cases the slasher tender cut off more of the sheet than was necessary. By being careful to tie the ends short and cut off no more of the sheet than was absolutely necessary, the tender was able to significantly reduce waste.

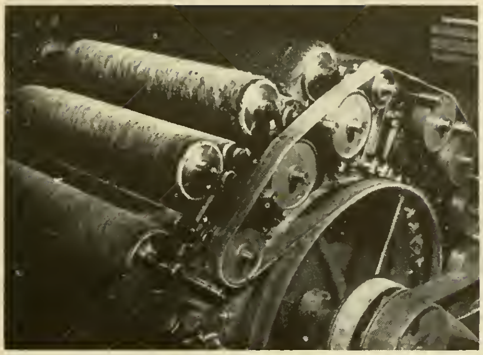
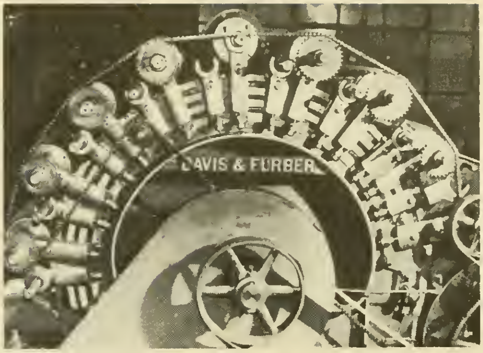
c. Yarn cut off beams at end of each slasher set

Beams in a slasher set did not run out at the same time regardless of the care taken in measuring them at the warper. The mill equipped all warpers with predetermined counters and automatic knock-offs, and yarn left on the empty beams was considerably reduced.

d. Thrums at start and finish of warp

Thrums at the waste room were about normal, but they had been used to clean looms and contained a great deal of foreign matter such as size, dirt, and oil. This foreign matter greatly increased the weight of the thrums and threw them into a waste classification much lower in value than clean thrums.

The use of thrums to clean looms was stopped, and a better separation of clean waste from oily waste was made. Although these steps did not actually reduce waste, they did raise the over-all value of the waste that had formerly been classified as thrums.

EXTRA FANCY goes on the breaker cylinder in place of the fifth worker and stripper. The fancy is driven by the stripper belt and leads the cylinder by 20% in surface speed. Setting of the new fancy has to be determined for each type of stock. The new roll lifts up the fibers so that the following workers and strippers have more fibers to act on.

Extra Fancy on WOOLEN CARD Increases Carding Action 60%

▶ Replacing the fifth worker and stripper on the breaker cylinder with a fancy gives the remaining workers and strippers a better chance to do their job. In addition to increased carding action, the extra fancy gives better blending and improved evenness.

By W. HODGSON

Tests made over the past three years with an additional fancy on the breaker cylinder of a three-section woolen card have shown the following advantages:

1. Up to 60% increase in carding power on the breaking cylinder
2. Improved blending of the stock
3. Better evenness of the intermediate-feed sliver

The card used for the tests was a 40-in. three-cylinder, Davis & Furber card with No. 25 garnett breast, breaker cylinder, center-draw broad-band intermediate feed, intermediate and finisher cylinders, and an 80-end tape condenser.

Test Basis

Our initial tests on the breaker cylinder showed that the amount of stock being actively carded at any time fell progressively from the first to the last worker. We assumed that

Worker	50% 64s colored laps 50% scoured Australian lambs				70% 64s colored laps 25% Vicara 5% rayon staple			
	With no 5th worker		With the extra fancy		With no 5th worker		With the extra fancy	
	Weight of fibers on worker (grains)	Percent	Weight of fibers on worker (grains)	Percent	Weight of fibers on worker (grains)	Percent	Weight of fiber on worker (grains)	Percent
1	134.5	100.0	132.5	100	270	100.0	250	100.0
2	105	78.0	102	77	136	50.5	116	46.4
3	98	72.8	97	73	127	47.0	103	41.2
4	94	69.8	85	64	110	40.6	92	36.8
5	Removed	—	Fancy in use	—	Removed	—	Fancy in use	—
6	114	84.7	407	307	125	46.6	460	184.0
7	90	66.9	187	141	100	37.0	211	84.4
8	92	68.4	148	112	102	38.0	155	62.0
Total wt.	727.5 =	100%	1,158.5 =	159%	970 =	100%	1,387 =	143%

FIBERS ON EACH WORKER were carefully hand-carded off and weighed. Total of fibers being actively carded was higher with the extra fancy in place. The author assumes that the variation in worker load at the sixth worker (when there was no fifth roll in place) does not affect the validity of the findings.

the load carried by the first worker was 100%. The load dropped gradually to about 60% on the last worker with an all-wool stock and to about 40% on wool-synthetic blends. Little change was noticed with either equal or progressive worker-cylinder settings.

In an attempt to lift this worker load and also to minimize the danger of cylinder loading, we removed the fifth worker and its stripper and replaced them with a worker covered with fancy fillet. This fancy, fitted with a 5-in. pulley and driven by the stripper belt, had a 20% lead on the surface speed of the cylinder. Settings into the cylinder varied with the type of stock carded.

Carding Power

On all-wool stock, our tests showed that the workers did 60% more work with the extra fancy in place. On a wool-synthetic blend, the workers did 43% more work. We determined the above figures by collecting stock from the workers and weighing it. We used a hand card and were very careful to lift only those fibers that were being actively carded, not those in the bed of the card clothing.

Blending

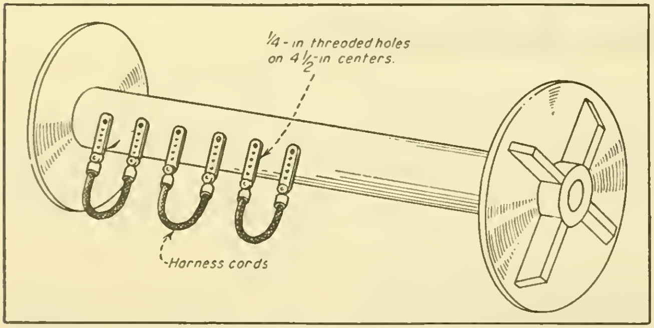
The effect of the fancy on blending was checked by feeding alternate weighings of black and white stock to the card and then checking the intermediate-feed sliver for shade variation and intimacy of blending. Without the new "worker-fancy," the sliver-color change was from black through shades of gray to white. With the worker-fancy in operation, the extremes in shade were much less pronounced—from dark to light gray—indicating that a more nearly perfect blend was being produced.

Evenness

We believe that evenness is better because blending is better. Hopper feeds are not 100% reliable, and variations in weighings do occur. If blending is better, variation in the breaker-section product must be less. We attempted to check regularity on an evenness tester but could not keep the bulky sliver between the condenser plates.

Work is now in progress on applying this extra fancy to the finisher cylinder in the hope of reducing long-term variation in yarn.

Harness Cords Hold Ends on Steel Loom Beams



WARP YARNS are held securely by 24-in. harness cords screwed to the steel loom-beam barrel.

We recently bought new all-steel warp beams for our 120-in. C&K W-3 looms. We had been using wooden beams and had stapled ropes to the barrels of the beams to hold sections of warp ends at the beginning of the beaming operation.

We could not staple ropes to the steel beam barrels. The barrels have ¼-in. drilled-and-tapped holes on 4½-in. centers. We tried to fasten the ropes to the barrels with machine screws at the holes, but the ropes pulled out. Washers on top of the ropes held the ropes securely, but the washers stuck up and broke warp ends when the beams were nearly empty at the looms.

We solved our problem by using harness cords. The cords are the braided-yarn-over-steel-cable type. The second hole from the end on the leather pieces on the ends of the cords is punched larger to take a ¼-in. machine screw. Then the screws are fastened to the holes in the beam barrels so that each cord forms a loop.

Sections of warp ends are fastened through the loops and are held securely. If a narrow warp is to be made on the loom beam, we simply unscrew one or two harness straps and adjust the beam flanges. On wide warps, we add extra straps.

Our beamer tenders like the harness-cord arrangement better than any method we have used; and the warps run well in weaving. *William R. Turner, Hamilton, Ohio.*

Card-Clothing Life Is Changed By Nylon

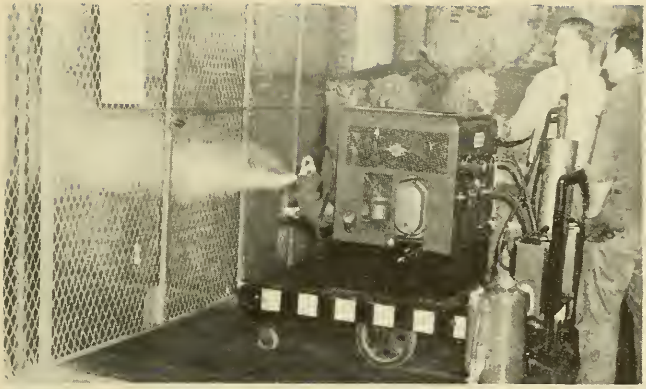
Technical Editor:
What is the life expectancy of card clothing when nylon is being carded? How does this data compare with similar clothing used for wool alone? (9480)

This question cannot be answered specifically, but here are some general conclusions that may help you.

If you're running nylon on metallic card clothing, the clothing life will be about 70% shorter than when you are running wool, according to one authoritative estimate.

On fillet card clothing, the life seems to depend on the way you run the machines and the type of wire you select. Nylon calls for stronger wire than wool. If you just change from wool to nylon and don't make any changes in your card, you can expect the wire to be completely ruined in about a year.

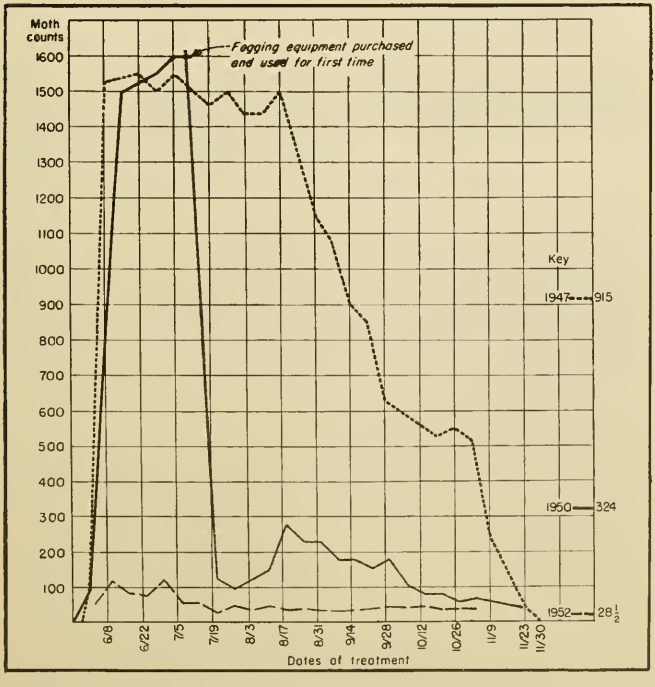
However, if you use double-convex wire of the proper count and crown and with a proper foundation, and if you have a garnett breast to open up tangled fibers, and if you don't try to run your cards too fast—the clothing should last as long for nylon as it does for wool.



MACHINE FOGGING requires only 3 mins. for a large warehouse area. At the end of the 3 mins., the operators move the machine to another fogging location.

MOTH TRAP consists of an electric light bulb (arrow) hung in funnel-shaped piping suspended from the ceiling near stored bales. A fan inside the trap sucks the moths into the bottle at the right, which is partially filled with water.

Dry Chemical Fog Eliminates **MOTH DAMAGE** to Wool



FIRST FOGGING IN 1950 brought the July weekly moth count down from 1600 to 100 and lowered the yearly average to 324. The 1952 weekly average moth count was only 28½.

- **Dry fog sprayed into the air kills moths and moth eggs in and around bales of wool**
- **Weekly moth-count average in Albany Felt Co. warehouse has dropped from 915 in 1947 to 28½ in 1952**

By PETER JONES, Albany Felt Co.

DRY CHEMICAL FOG that kills moths and moth eggs laid in raw wool stored in bales has reduced weekly moth counts from 915 in 1947 to 28½ in 1952 at Albany Felt Co., Albany, N. Y.

Two men, operating a fog-generating machine 1 hr. a week, completely fog everything in the 94,200 cu. ft. of warehouse space. Moth and egg coverage is virtually complete.

It Was an Old Problem

Albany Felt had been bothered with moth damage to baled raw wool since the founding of the company in 1895. Before 1946, when DDT was made available for commercial use, the mill had moth counts in its warehouse

traps averaging 1,000 moths per week between June and November every year.

In 1946, the mill started spraying with DDT wettable powder. Immediately, weekly moth counts began to improve. In 1947, the average count during the summer months dropped to 915; in 1948 to 840; and in 1949 to 600.

Up through 1949 and part of 1950, two men spent 20 hrs. a week completely spraying the main five-story brick-and-concrete warehouse, which can hold up to 2,000 bales of wool. Spraying was done by hand, and it was impossible for the men to reach behind bales, often stacked six and eight deep and six bales high from the aisle to the wall.

The weekly moth count still stood at 600 when a fog-spraying machine was tried.

The nonflammable moth-killing chemical mixture consists of 2.2% lindane, 5.0% stabilizing agent, and 92.8% hexachloride hydrocarbon. The machine that emits the fog is called the Tifa insecticide applicator, manufactured by Todd Shipyards Corp.

The cost part of our moth-killing story is as follows:

The fogging machine cost $1,850. The cost of the chemical mixture is $5.75 per gallon, and 6 gals. are used each week, which makes a weekly chemical cost of $34.50. The labor required to fog the warehouse amounts to only two manhours a week (1 hr. each for two men).

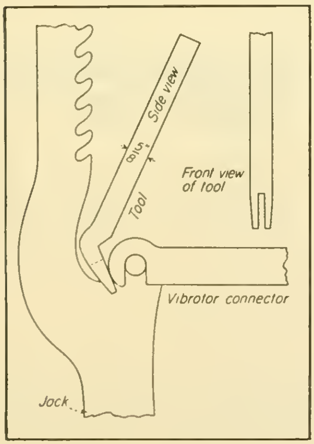
The fogging is usually done after 3 p.m. on the last work day of the week, and some of the fog still remains in the air the following morning.

We fogged our warehouse for the first time on July 12, 1950, and our weekly moth-count average for the year was cut almost in half overnight. For the first time, the antimoth chemical actually penetrated the bales of wool, seeped in a couple of inches to kill the worms, and reached inaccessible bales that the sprayers couldn't get to. With the weekly machine fogging during 1950, the moth count averaged 324, compared with the previous year's average of 600.

Our 1952 results were even better —down to a 28½ moth-count average per week—because last year we also started fogging our secondary warehouse in downtown Albany and thus killed off embryo moths there before they arrived in bales at the main warehouse.

A few moths and other insects still reach the main processing plant. Fogging these areas is difficult because we have to shut down machinery and close off fire stations for a time. Nevertheless, it pays us to fog the main plant at least twice a summer, in addition to our routine warehouse fogging.

Here's a Tool To Remove Vibrator Connectors From Jacks



NEW TOOL is placed underneath the tip of the vibrator connector with the handle against the jack. Give the handle a sharp jerk, and the connector comes loose.

We used to have a lot of trouble removing vibrator connectors from jacks when either part became broken on our W-3 looms equipped with Knowles head motions. Our old way of removing the connectors was to drive them off the jacks with a screwdriver and hammer. We broke and bent a lot of connectors and jacks this way and had to replace them with new ones.

We have made a tool that removes connectors with just a flick of the wrist.

The tool is made from an old box-lifter rod. One end of the rod is heated and flattened to ¼-in. thickness for a distance of 2 ins. A slot 5/16 in. wide and 1 in. long is cut in the center of the flattened end.

The rod is reheated on the flattened end and bent to a gooseneck shape with the slotted surface parallel to the body of the rod. The over-all length of the tool is 28 ins.

To remove a vibrator connector, we merely slide the slotted surface of the tool underneath the tip of the connector, place the heel of the tool against the jack, and give the handle a quick jerk.

The connector pries off easily without danger of breakage. *John W. Lewkowicz*, Brockton, Mass.

Time the Head Motion To Stop Harness Skips

Technical Editor:

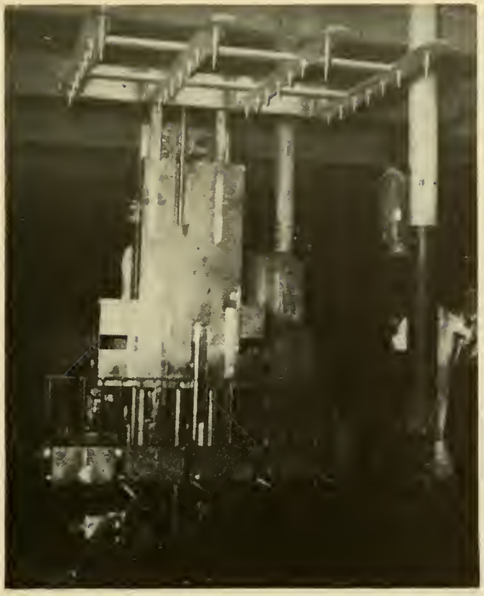
How can I prevent harness skips in wool-synthetics blends? (9801)

Ideal conditions under which to weave this fabric are with a Knowles head on either a W-3 or a C-4 loom. This head and the throw of the crank arms on these looms give a clean shed. The Knowles-head timing should be made by setting the box motion to medium, slow, medium. This setting will give a harness setting of fast, medium, slow that will separate the warp ends.

If you're weaving the fabric on any other loom than W-2, W-3, or C-4, your shed opening may be too small because your crank-arm throw is not great enough to clear your shuttle sufficiently. If this is true, your only alternative is to use a smaller shuttle and reduce the size of your filling package.

Your harness timing, too, will affect the cloth skips. On C or W looms, time the harnesses to cross at 2¼ ins. from the beat of the cloth (front-center position of the lay).

An article [TW, Sept., '52, p. 93] on this subject may give you more ideas.



JAWS CAN TAKE AN 8-FT. BITE. That rack above the bottom tines sweeps forward any loose wool as the truck moves into a pile of wool. This arrangement not only makes it easier to really clean out a bin, but it also prevents loose wool from being run over by the truck.

AS THE TRUCK DRIVES FORWARD, the lower tines slip under the wool and the upper forks clear the top. The tines on the front section of the upper forks are longer than the others in order to hold the wool better in transit and to insure a clean break when the bite is taken.

New WOOL-HANDLING Device Saves $20,000 a Year

HIGHLIGHTS: Four large worsted mills in New England are using a special lift-truck attachment to handle wool in blending. Not only does the new system save plenty of dollars; but the mills also report better blending, more efficient use of floor space, reduced safety hazards, and neater housekeeping. The device, interchangeable with standard forks or clamps on a basic truck, costs about $2,600.

By MICHAEL J. KOROSKYS
Assistant Professor, Wool Department, Lowell Textile Institute

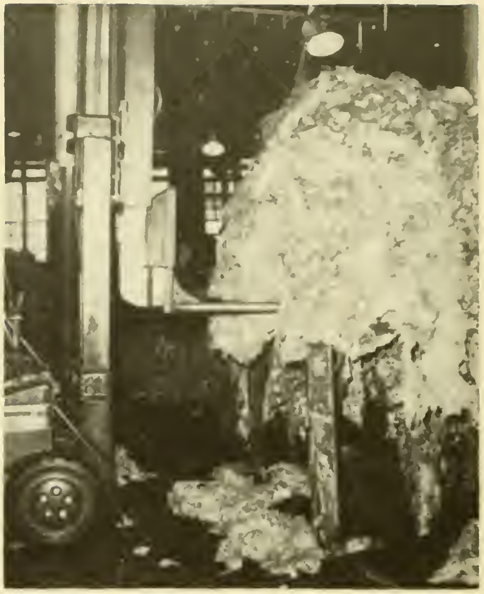
Handling grease wool used to be a pretty messy and a very tough job for a man, and the nature of the job itself often resulted in improper blending. Several New England mills are now using a special attachment on their standard lift trucks to make this task easier, save money, and improve blending.

At the mill where the jaws were developed, wool was sorted directly, through traps, into bins in the floor below. The different wools that made up the blend were put into the bins in layers, and the first blending was based on cutting these layers vertically when the wool was taken from the bins. But the natural tendency of the men that did this job was to roll the wool off the top once in a while — and doing this rolling off the top meant that the value of the sandwich blend was lost.

These men used to fill up trucks with the raw wool and then dump the trucks over floor chutes that fed the wool directly into the hoppers of the scouring bowls. The slotted trucks that the men used held about 500 lb. of wool, and the distance the truck had to be pushed depended upon the blend and the scouring train that was being fed.

Realizing that something should be done to improve this procedure, the mill called in engineers of Brodie Industrial Trucks, Inc., Malden, Mass., who worked out the mechanical method of handling the wool. After trying 12 experimental designs, the engineers settled on the present model. The device, now patented, is

SQUEEZE PLAY IS PULLED by the powerful hydraulic jaws. The compression permits handling of fiber with a normal staple length without droppage. When the load has been broken away from the pile like this, the truck backs away and carries the load to its destination.



UPPER FORKS LIFT AND LOWER TINES ARE WITHDRAWN as the truck backs away to complete unloading. You can see that the wool is in the same vertical cross section as before and the uniformity of the blend has been preserved.

being manufactured by Clark Equipment Co.

How It Works

The improved method, a lift-truck attachment, grabs up to 750 lb. of fiber, carries it to the chutes, and unloads directly into the chutes. There is no more manual handling or trucking.

Loading. First you raise the toothed upper jaw of the clamp to get the maximum size of bite. The opened jaws can then be elevated to bite wherever you want — the top half of a 16-ft. pile, for instance, or all of an 8-ft. pile.

The next step is to drive the truck forward and penetrate the pile with the lower tines. The upper forks always have to clear the top of the pile. The wool is then clamped between the jaws, and the load is raised to cut the blend and take advantage of sandwiching. The tight bite and vertical motion insure a clean break with the rest of the wool.

After the bite has been made, the truck is backed away, the load is lowered to the desired carrying height, and off you go to the unloading area.

Unloading. After you reach the place where you want to unload — be it an open floor or a chute — all you have to do is position the load, raise the top half of the jaws, and withdraw the lower tines as you back the truck away.

If you unload into a chute, the opening should be about 2 ft. larger in length and width than the load of wool you are carrying. The lower tines are lowered to the chute rail, and the truck is backed away to release the load.

You can use the device to load hoppers also if you modify the hopper a little bit to receive the load of wool.

The modified hopper should be more square than rectangular and should be funneled into the original hopper. If the load of wool is 6x6, the hopper should be at least 8x8 at the top.

You can unload directly onto the floor too, if you want, because the weight of the wool holds it in place as you withdraw the lower tines, and the squeeze that the wool got makes the pile neat and firm — not a big mess on the floor.

Either Gas or Electric Trucks Can Be Used

As is usually the case, the truck you select will have to have the specifications that fit your installation. If you're going to use the truck in a confined area, you'd most likely select

Not for Wool Alone

This device can be used for any fibers that require blending by the bin or sandwich method. For that matter, even if the problem is not blending, the new attachment can be used for any bulk handling of wool or other fibers — or for blends. You can use it with scoured wool, to feed card hoppers, to handle wastes, for matchings or sorted wools — in any number of ways. The jaws can be modified to handle any combination of fibers.

You can pick up from 250 to 750 lb. of wool from a pile, bin, or other area. And you can unload onto the floor, into a chute, into trucks, or in hoppers.

Openings of chutes or hoppers, for best results, should be equipped with funnel-shaped tops for quick and easy unloading.

a battery-powered truck and would have to think about charging the batteries. In open areas, however, gasoline-powered trucks are usually preferable.

Some of the factors to be considered in selecting the basic truck are:

Bulk and weight of load
Load capacity of the floor
Number of shifts to run
Maximum height of fiber bins
Distance from bin to chute

Initial cost of the truck, complete with the wool-handling device, is somewhere between $5,000 and $8,000. If you already have a lift truck to which the device can be attached, you can get the attachment alone for about $2,600.

The wool-handling device is quickly interchangeable with standard forks or bale clamps; so you don't have to set aside one truck for bulk-wool handling alone.

Four Mills Report Big Savings

The average saving of four large worsted mills that are using this equipment is $400 per week. Two men, with the truck and wool-handling device, have replaced an average of 12 men per shift in each plant. In one plant, the team did what 14 men used to do — and the new method is improving quality as well as reducing costs. Two men with the truck can handle about 100,000 lb. of grease wool in an 8-hr. shift.

The blending setups don't have to be the same, as you can see from the methods at the four mills.

Mill A—Wool is sorted into blending bins and transported to chutes that feed the scouring trains.

Mill B—Wool is sorted into blending bins on the same floor as the scouring trains. Truck feeds scouring hoppers directly.

Mill C—After being sorted into bins, the wool is unloaded onto the floor. Stock is then placed on a conveyor.

Mill D—Wool is trapped in the blending bins and unloaded into chutes.

Why Two Men?

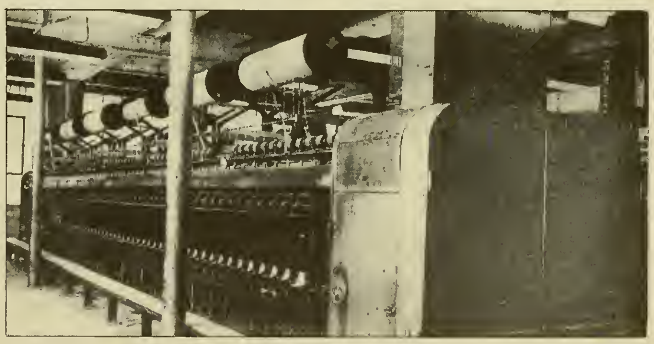
The truck operator needs a helper to direct him, to take care of any spillage, and to make sure that loading and unloading is done smoothly. This second man allows the driver to tend to his main job — operating the truck.

Advantages—In Brief

One mill superintendent summed up the advantages this way:

"We've cut costs and are saving manpower — that's obvious — but there are some hidden advantages also. Our blends are being maintained better — there's no more rolling wool off the top of the pile. The new gadget is better from a safety angle, too, because it eliminates men working around a hole. Our housekeeping is better — there aren't as many trucks to clutter up alleys and spill wool all over the place. And we can make better use of our floor space now. I guess you've guessed by this time that we're really 'sold' on this improvement."

Converted Spinning Frames Give Twister Package Four Times as Big

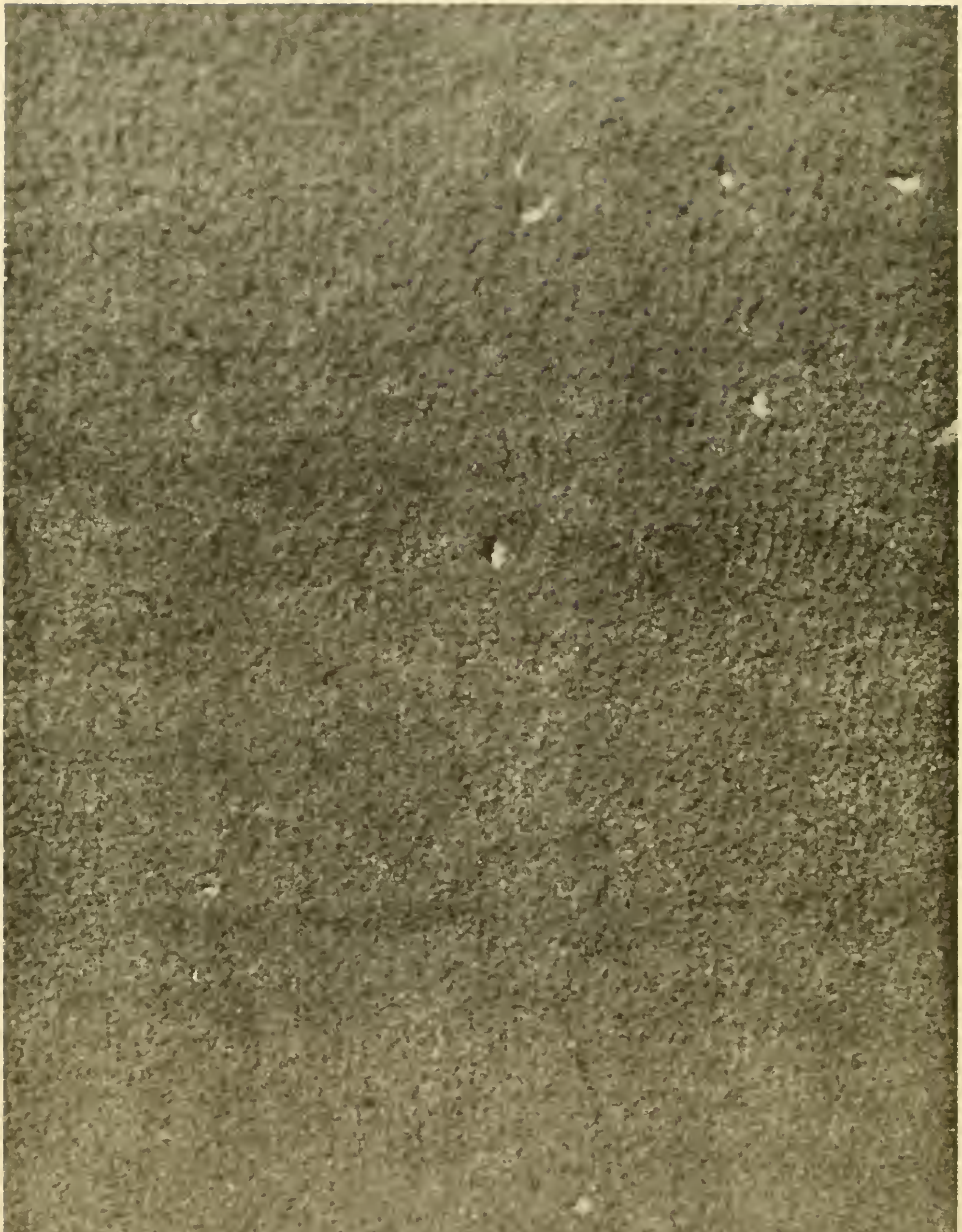


FORMERLY WOOL-SPINNING FRAMES, twisters now produce a 20-oz. package. Regular twisters make a 5-oz. package.

We had an order calling for thousands of pounds of double-twist yarn at a time when our regular twisters could not be spared for this work. The following method was devised to make this twist on Whitin wool spinning frames.

We removed the spool drums and paired the spool stands to take the spools of yarn. A strip of wood was fastened to each spool stand, and a $\frac{3}{8}$-in. hole was bored near the ends of the wood directly over the twister heads. A $\frac{3}{8}$-in. rod was passed through the holes to act as a guide for the yarn. The spools, each having 40 ends of yarn, were hung on the spool stands. Twenty ends were passed over the guide rod and through ten twister heads on one side of the frame; the remaining twenty ends were passed over the guide rod and through ten twister heads on the other side of the frame. Six spools that contained 240 ends were hung on the stands and thus prepared 120 ends for twist. A piece of spindle tape with a weight attached gave the necessary tension to the spools. The chain driving the twister heads was removed because the twister heads do not revolve in this operation.

The package from the spinning frame weighs 20 oz., while the package from the regular twisters weighed only five ounces. We therefore eliminated many knots. *Albert Friedrich, Putnam, Conn.*



We Check Our WOOL BLENDING With Ultraviolet Light . . .

By dyeing 1% of the fiber in a blend with fluorescent dye and using u.v. light, Nye-Wait engineers can—

- **Check results of a change in blending methods or in fiber components**
- **Make card-performance surveys**
- **Persuade department heads and machine operators that they could be doing a better job**

By CHARLES L. SHELTON
Chief Textile Engineer, Nye-Wait Co., Inc.

We use ultraviolet light to check on our blending all the way from the picker to the loom, with the result that we're now getting better blends. By use of the technique, which involves a tiny amount of fluorescent dye, we can check the uniformity of fiber distribution per unit volume in wool blending at different stages of manufacture. A secondary, but important, benefit has been obtained in showing machine operators that management has a way of checking the thoroughness of the blends, as well as evaluating certain phases of the quality of the work done by the different machines.

Our technique consists essentially of stock dyeing about 1% of a white-wool batch, or some one component, with a 1% dyeing of such a fluorescent dye as Calcomine Brilliant Flavine S, for example.

This dye is not strong enough to be discernible in the final yarn, when reasonably blended, and does not interfere with subsequent dyeing into different shades. The light shade of the yellow stock-dye merges easily with the natural yellow of wool and is not noticeable in the spun yarn before dyeing. By the use of a portable ultraviolet light ("black light") the blended batch can be examined statically prior to oiling and in motion at each subsequent operation.

. . . In Picking

In the picker-house bins, after blending, when the stock is viewed under u.v. light, large lumps of dyed stock stand out boldly. To obtain a "uniformity index" at this point, a cubic-yard box can be filled at random and a transparent ruled glass put on top. Under u.v. light a percentage of area can be obtained to represent "lump" distribution. Several readings will not only give a fair index of uniformity but will also provide a fair scale of "lump size."

After the blend is processed through the oiling picker into the card-room bin, some more cubic (sq. yd.) readings can be obtained, together with measurements on the decreased size of lumps of wool, with the fluorescent-dyed stock being used as an indicator.

. . . In Carding

By means of the portable u.v. lamp, the performance of the stock in the card-hopper bin and during the carding action can be watched. The roping that comes off the breaker card and the finisher card will show the degree of uniformity of fiber distribution and will also show up poor carding in the form of uncarded "pills." By means of a ruled glass, with a smaller container for the stock, readings can be made on the number of "pills" appearing under u.v. light.

. . . In Spinning

An examination of the filled bobbin from the mule after spinning gives the first criterion on the over-all levelness of the fiber distribution and quality of carding. The bobbin is a good check point because the filling wind employed on the mule bobbin shows a strand or two along the length of the bobbin for approximately every 6 ft. of yarn. Thus, the side of a giant-package bobbin will show relative fiber distribution, under u.v. light, for approximately 1,000 yd. of yarn and is representative of about 80,000 yd. on an 80-end card.

. . . In Weaving

Plying three or four ends of grease singles for the pile warp and weaving up a sample of carpet are the final steps in the preparation of the fibers for a comprehensive study of fiber distribution in the blend.

In weaving, because of the random in plying the singles yarn and in positioning the warp ends side by side, areas of the cross sections of fibers (cut pile) can be obtained that will be very representative of large quantities of stock. Under u.v. light, a microscope can be used to take a dyed-fiber count for a given area with a ruled glass. This technique presents an interesting optical effect wherein the cross sections of the individual dyed fibers will appear as the "milky way" with an occasional "pill" or two to represent some distant planet.

. . . In Evaluating Changes

This technique has been found excellent for studies in changes of blending procedure, changes in fiber components, card-performance surveys, and other operations where stock may be mishandled or any information desired.

. . . In Convincing Supervisors and Workers

This procedure is also most convincing to card-room personnel on the touchy subject of carding improvements. Defective carding due to poor settings and inadequate grinding are clearly shown. The use of fluorescent dyes on any component in a blend being studied clearly shows how much drops out from under the card and other machines. This method is helpful in studying the performance of waste in a virgin-wool blend.

In the plant, new interest in cooperation arises spontaneously in "old timers" who can actually see what the technical man is trying to do. Such convincing techniques can arouse considerable interest and cooperation. When we ran our first experiment some years ago, we were delighted to see the interest displayed by all operators as the stock passed through their machines under the u.v. light.

Personnel men may well regard this demonstration as a morale booster with respect to on-the-job education. The nice thing about it is that experiments can be carried on from batch to batch without interfering with regular production.

←

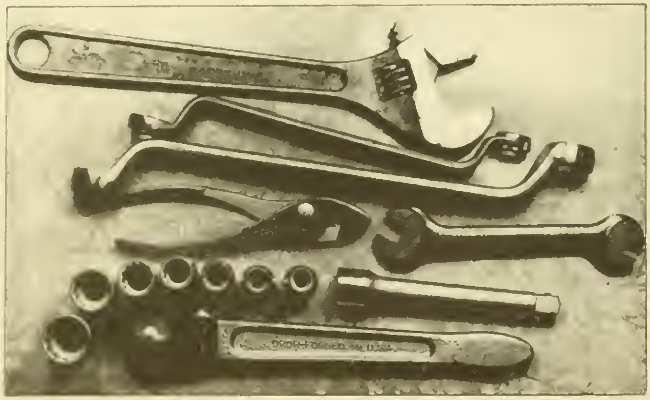
ULTRAVIOLET LIGHT used for this photograph shows large lumps of fiber that were not thoroughly carded out. The camera, of course, is not close enough to show clearly the good individual-fiber distribution.

FIVE POCKET TOOLS—an 8-oz. ball-peen hammer, a 10-in. screwdriver, a $\frac{1}{4}$x$\frac{3}{8}$-in. setscrew wrench, a $\frac{5}{8}$x$\frac{3}{4}$-in. open-end wrench, and a $\frac{1}{2}$x9/16-in. open-end S-type wrench—will do two-thirds of all loomfixers' work.

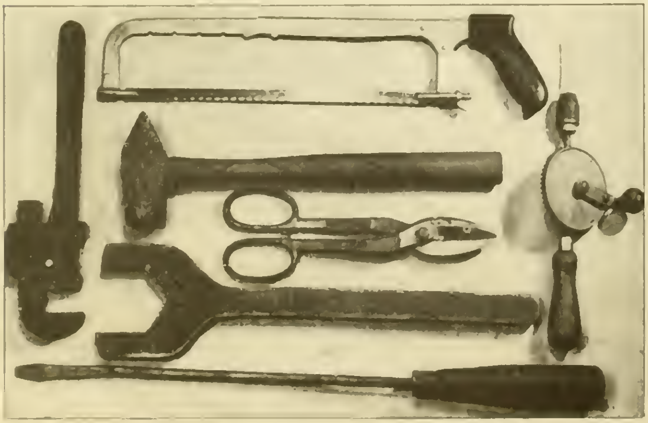
GOOD and for FIXING

▶ Poor tools and "slap-bang" loomfixer methods go together. For good loomfixing, throw away worn tools and replace them with special tools for easily and quickly setting looms to the gauges that are now a part of every good loomfixer's equipment.

By WILMER C. WESTBROOK
Consulting Editor, TEXTILE WORLD



KIT TOOLS—including an adjustable wrench, two offset box-socket wrenches, pliers, large setscrew wrench, seven socket wrenches of graduated sizes, a 4-in. extension, and a socket wrench—should be within easy reach of every loomfixer.



HEAVY TOOLS—including a large screwdriver, auxiliary-shaft wrench, tin snips, hand drill, Stillson wrench, 4-lb. hammer, and hacksaw—should be among the large store of tools kept in a loomfixer's tool box.

HIGH-SPEED LOOMS have made precision settings necessary for the closely machined parts, and these settings require special tools and gauges. The old-time loomfixer, who needed only a hammer, screwdriver, and two or three wrenches to keep his belt-driven E-model looms in good condition, has dropped his rule-of-thumb methods and substituted new tools and new gauges to fix looms better.

Five Tools Make Most Repairs

But two-thirds of all loom repairs can still be made with the few tools formerly used. The other third requires a whole toolbox full of tools and gauges.

The basic tools are carried in loomfixers' pockets. Generally these tools are included: an 8-oz. ball-peen hammer, a 10-in. screwdriver, a $\frac{5}{8}$x$\frac{3}{4}$-in. open-end wrench (No. 34), a $\frac{1}{2}$x$\frac{9}{16}$-in. open-end S-type wrench, and a $\frac{1}{4}$x$\frac{3}{8}$-in. setscrew wrench. With these tools, a loomfixer can remove, replace, and adjust pickers, picker sticks, shuttle boxes, binders, checkstraps, power straps, picker-stick guides, temples, warp stop motions, feelers, and some of the gears and cams.

For greater speed on some of these jobs, 12-point offset box wrenches are often used to replace the old standby 34 and the S-wrench. For many recessed setscrews, a T-wrench is used instead of a regular setscrew wrench.

Leather pocket pouches for tools are a good protection for loomfixers' clothing.

BAD TOOLS

LOOMS

UNSAFE TOOLS injure loom parts and are an accident hazard. The screwdriver has a rough handle and rounded point, the pliers are worn, the hammer has a chipped head and splintered handle, and the jaws of the wrench are worn.

Other tools should be kept in a small tool kit with a handle so that the kit can be moved from loom to loom. If the kit is used on E-model looms, it can be hung on the breastbeam of the loom with small hooks. Cleats on the bottom of the kit will hold it firmly to the breastbeam of X-model looms.

These tools should be kept in the kit: pliers, a pair of leather punches, center punches, box-end wrenches, large setscrew wrenches, adjustable wrenches, socket and speed wrenches, special wrenches to fit thread cutters and feelers, lay-positioning gauges, picking-motion gauges, and other tools. Cotter pins, small screws, and many small repair parts such as thread-cutter knives and springs can be kept in the tool kit for quick repairs to loom parts.

Use Special Tools for Big Jobs

Heavy tools for overhauling jobs are usually kept in a large tool box when they're not being used. These tools include 2-, 6-, and 8-lb. hammers; an auxiliary-shaft wrench; a Stillson wrench of 10-, 14-, or 18-in. sizes; tin snips; a hacksaw; assorted screwdrivers; a hand or electric drill; chisels; punches; and several sizes of files and rasps.

Most of these tools are used infrequently; but they must be present for breakdowns such as worn or broken camshafts, crankshafts, head gears, loomsides, lay swords, etc. The smaller pocket-size wrenches are just too small for these jobs.

The most frequently used loom gauges are the reed square, 12-in. straightedge, 24-in. straightedge, picking-motion gauge, lay-positioning gauge, and a 6-ft. rule. Every loomfixer should have these basic gauges. Two of the gauges, the picking-motion gauge and the lay-positioning gauge, are for specific models of looms and should not be used on any looms other than the ones they're made for. The other four gauges are standard for all looms.

Other loom gauges that are seldom used should be kept in a central location to be available to all loomfixers. One set of these gauges is usually enough for a weave room.

Oil Looms; Avoid Unsafe Tools

Although the modern loomfixer isn't called on for production loom greasing, he can use an oil can and hand grease gun to save himself much work and save wear and tear on his other tools. In addition to any loom parts he finds that need lubricating, he should always oil or grease new parts he puts on if they require lubrication.

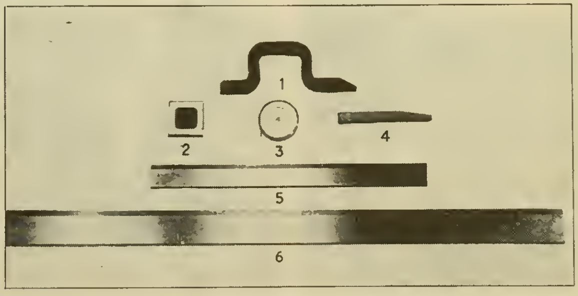
A short hook or awl is also part of the loomfixers' lubricating tools and should be used to clean out oil holes. A brush or paddle should be used to grease gears and cams.

The tools listed here will be adequate for most loom repair and maintenance jobs on under-cam looms without special loom motions. On looms of other types, the tool list will be incomplete.

It's important to have tools that fit the job, but it's more important to have tools that are in good condition. An ill-fitting or widely spread wrench will make the job to be done harder. Improper tools will also slip and often cause serious accidents.

Pliers should never be used in place of a wrench because the nut cannot be turned enough to hold it tight and the pliers will often slip and wear off the corners of nuts. Other unsafe tools are: a hammer with a defective handle or chipped head, a screwdriver with a rounded or too-sharp point, a chisel with a mushroom head, and a file without a handle.

Keep These Tools Handy



SIX LOOM GAUGES—picking-motion gauge, reed square, steel rule, lay-positioning gauge, and 12-in. and 24-in. straightedges—fill the bill for most loom settings. Other gauges are needed infrequently.

NEW CARPET BACKSIZER processes up to 15-ft. widths. The ducts at each side of the machine carry away dirt and lint set free in the brushing operation.

Carpet Mill Installs New BACKSIZERS

▶ McBride backsizers installed at the Archibald Holmes & Son plant help maintain efficient production of quality carpeting material. Carpet widths up to 15 ft. are backsized at speeds up to 10 ft. per min.

By **MICHAEL LONDON**, Assistant Editor, TEXTILE WORLD

Archibald Holmes & Son, Philadelphia, Pa., recently installed two McBride carpet backsizers. One machine is designed to process carpet up to 15 ft. in width, while the other is used for simultaneously backsizing two carpets 27 to 36 ins. wide. The 15-ft. machine can process up to 10 ft. of carpet per minute.

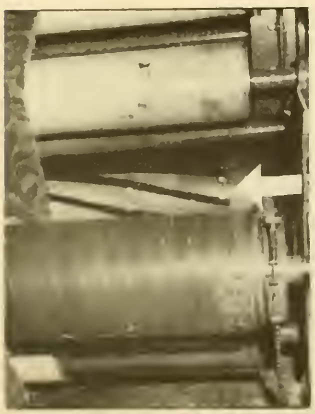
Carpets are backsized with a thermosetting protein resin. Before running over the size roll, the back of the carpet is brushed with a high-speed nylon-backed brush to remove dirt and lint. A suction device, developed by Holmes, removes the dirt and lint to keep it from entering the size box. Tension on the carpet is applied by tension bars and a fillet-covered tension roll over which the carpet passes. Then tension-roll let-off is governed by brake bands at both ends of the roll.

A lift roll is located just ahead of the size roll. A carpet not to be backsized is raised by the lift roll to clear the size roll. In the wide machine, the lift roll is hydraulically operated; in the narrow model, there are two lift rolls independently controlled by shift levers.

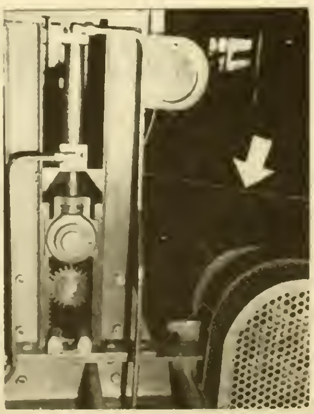
The speed of the size roll determines the amount of size take-up and is governed in the wide machine by a hydraulic control and in the narrow model by a Reeves variable-speed drive. A dial registers the speed of the size roll. No doctor blade is used.

After the carpet is sized, the pile is brushed and the carpet is steamed in a unit made by H. W. Butterworth & Sons Co., Inc. After leaving the steamer, the carpet is dried at approximately 240° F. in an Andrews & Goodrich, Inc., dryer unit. Drying completes the operation.

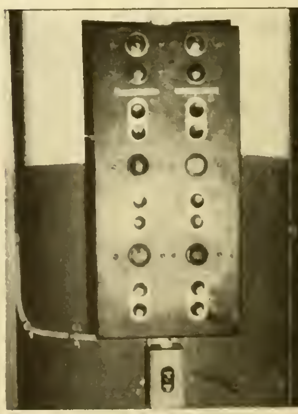
A convenient control panel is used to operate the brush, exhaust fans, and carpet roll in the steaming and drying operations. One man operates the range from backsizing to drying.



ROLL with let-off controlled by brake bands applies proper tension to the carpet. The spiral brush (arrow) removes lint and dirt from the carpet back.

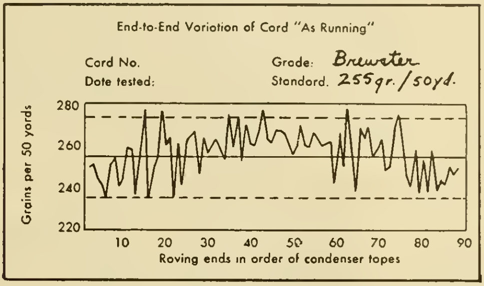


LIFT ROLL, hydraulically operated, raises the carpet (arrow) out of reach of the size roll. The meter (upper right) indicates the speed of the size roll.



CONTROL PANEL operates the brush, exhaust fans, and carpet roll in steaming and drying operations. One man operates the entire range.

Here's how Bigelow-Sanford Carpet Co. analyzed uniformity of woolen card roving and came up with a new device that improved roving uniformity . . .



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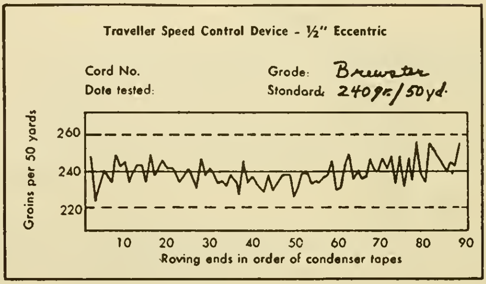


. . . TO THIS

Variable-Speed Intermediate Feed Improves CARD ROVING

By A. G. KLOCK and C. W. CARTER
Quality-Control Superintendent   Quality-Control Engineer
Bigelow-Sanford Carpet Co.

THE SCIENTIFIC PRINCIPLES of quality control applied to woolen carding have resulted in an improvement in product quality of nearly 100% at Bigelow-Sanford Carpet Co., Thompsonville, Conn. In the application of these principles, a new principle of carding and the design of an inexpensive attachment for this machine have also been achieved. This attachment makes possible the manufacture of textile yarns with uniformity previously unattainable. The device is readily adaptable to woolen cards and is being made available under license by Bigelow to both Davis & Furber Machine Co., North Andover, Mass., and Whitin Machine Works, Whitinsville, Mass.

In considering the quality aspects of any process, one looks primarily for uniformity. The quality characteristic of greatest importance in the carding process is the density, or weight per unit length. Since the weight characteristic of the yarn is determined by the card and since excessive variation in weight can result in fabrics of unsatisfactory quality, it is imperative that this variation be kept to an absolute minimum.

By "absolute minimum" is meant variation due only to pure chance. For well over 100 years, it has been recognized and accepted that the weight of woolen yarns varies widely. However, the extent to which chance causes affect variation has never been accurately determined, and considerable study must be devoted to answering the question, "How much variation is inherent in the process and how much variation is due to causes that can be corrected and controlled?" Such a study has been conducted on the carding process at the Thompsonville (Conn.) Plant of Bigelow-Sanford Carpet Co., largest carpet-manufacturing plant in the U. S.

In conducting a study of this sort, perhaps the best approach is to define how the process is currently running. This is accomplished simply by allowing the machine to run without adjustment, and measuring enough samples of its product so that an analysis may be made.

Here's Bigelow's Thinking . . .

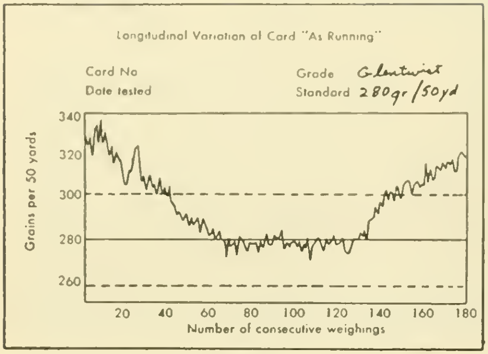


CHART A

1 The accepted means of taking measurements of roving in the textile industry is to weigh a given length of all ends on a jackspool and consider this as the "unit of product." This procedure was carried out for an entire spool from a card selected by the production supervisor as being one of the best-quality performers. Some 450 consecutive weighings were made, of which a typical section is shown in chart A.

It will be noticed that many tests fall outside of the specification tolerance. Further, these tests seem to fall in a cyclical pattern, and it was found that this pattern repeated itself somewhat irregularly throughout the spool. Translating the length of the cycle into units of time, it was found that the high points came every 10 or 12 min., and this was the clue to the cause for this excessive variation.

The only operation of the carding process that occurred with this frequency was the manual loading of wool into the feed box. It was easy to see that the effect of packing the feed box too full would mean roving very much heavier than standard, considering that the converse is true, i.e., a nearly empty feed box will result in very light roving.

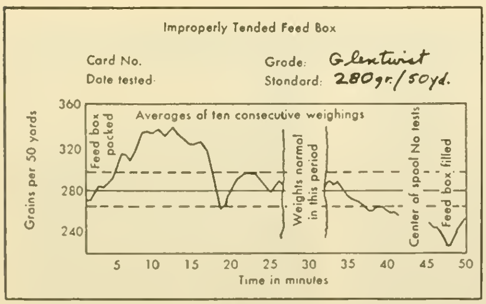


CHART B

2 If this were true, the same effect could be obtained by purposely packing a feed box and allowing it to run until nearly empty. The graphic result of just such a procedure is shown in Chart B.

This chart shows averages of ten consecutive weighings instead of individuals, as shown in Chart A, and is plotted on a time basis. It will be noticed that within 3 min. of filling the feed box the weights were in excess of the upper specification tolerance and that these weights amounted to as much as 21% above the standard. These heavy weights continued for approximately 12 min., during which time nearly 600 yd. of roving were produced.

It should be noted in relation to the rapid dip and rise of the weights at about 15 min. that this was due to a drive belt having slipped off the feed box and consequently the weighpan has missed one drop. For the next 20 min. or so, the weights were within specifications. After 40 min., however, the feed box would become sufficiently low to produce sub-standard roving. After about 47 min., the feed box was again filled, and the weights started to recover.

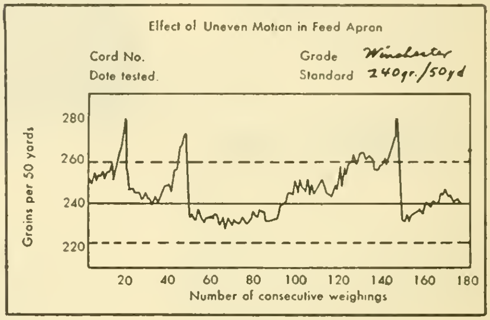


CHART C

3 Since it is desirable to produce roving within specifications and since this analysis showed that a great deal of variation stemmed from improper feeding, a scheduled controlled feeding wherein the box feeder deposits a known weight of wool every 10 min. was adopted. If this scheduled feeding had eliminated all excessive variation, such a test on another card should show all values to be well in control. Chart C shows just such a test.

The peculiarity of this test is that irregular "peaks" appeared. These peaks manifested a sudden increase in the weight of the roving of as much as 50 gr. within 7 or 8 yd. The irregularity of these peaks indicated to the carding foreman that they might be caused by uneven motion in the feed apron, and Chart D shows a test run on the same card after the motion of the feeding had been made smooth.

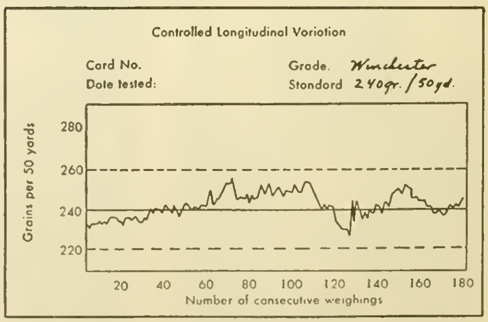


CHART D

4 Whereas it might be open to question whether Chart D reports purely random variation it, nevertheless, indicates that the product is well within specified limits, which are based upon product requirements.

Chart D is entitled "Controlled Longitudinal Variation" because these weightings are measures of the variation along

the length of the card. However, this measure tells us nothing of the variation across the card, i.e., among individual ends, because this system of weighing all ends has the effect of averaging out differences in weight.

Since there existed no standard method of testing the individual ends, it was necessary to devise a special technique. This technique was developed so that an accurate gauge of the 88 ends (four spools of 22 ends each) could be obtained. Chart E shows this end-to-end variation of the card "as running."

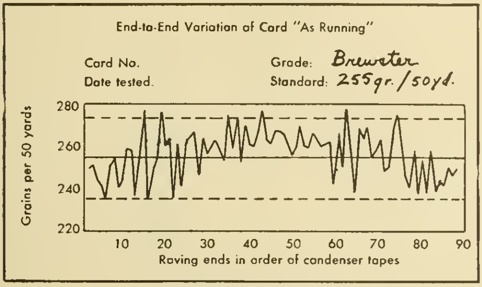


CHART E

5 It also reveals nine out of 88 ends as being outside of the specifications. The appearance indicated excessive variation, and when shown to the foreman, this variation was interpreted as the result of loose tapes in the front section of the card. However, there seemed to be a general trend across the card of increasing weight toward the center. A subsequent test, shown in Chart F, after the tapes had been tightened, brought this characteristic curve into much sharper focus.

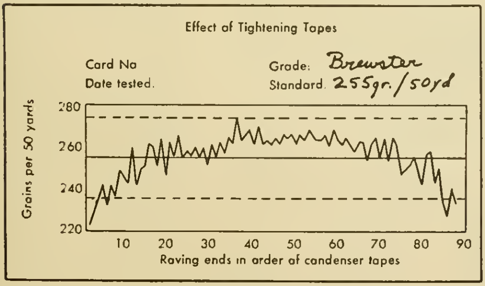


CHART F

6 The tape-to-tape variation has been noticeably decreased, but there still are five ends out of the specification tolerances. Many subsequent tests of this sort were run, and this characteristic curve repeated itself consistently despite the fact that all possible adjustments were made on the card.

Thus, this curve indicated the presence of a heretofore unrecognized cause of excessive variation, and a thorough engineering study was made to determine this cause.

The results of this study indicated that the operation of the intermediate feed was causing a certain stretching of the drawing as it was deposited at the sides of the feed table. Therefore, it seemed logical to overcome this stretching by driving the traveller at a slower speed as it approached the sides and at an accelerated speed as it moved past the middle. This variation in speed would deposit more wool on the sides and less in the middle. The variable-speed mechanism for carding apparatus (otherwise known as the Traveller-Speed-Control Device, patents pending,) has been developed to serve this function. This device works on an eccentric-gear principle, and is controllable through a wide range, giving it flexibility to handle all machine conditions and types of stock.

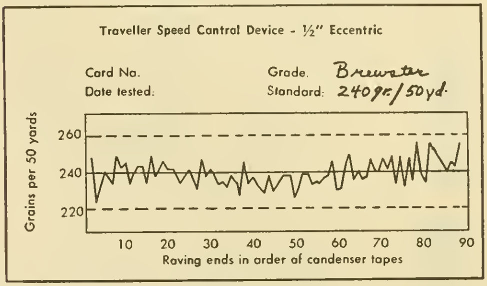


CHART G

7 Chart G shows the results of setting the devices at ½-in. eccentric, and it will be seen that the characteristic curve shown in Chart F has been effectively straightened.

None of the ends are outside of the specification tolerances and the characteristic is relatively flat.

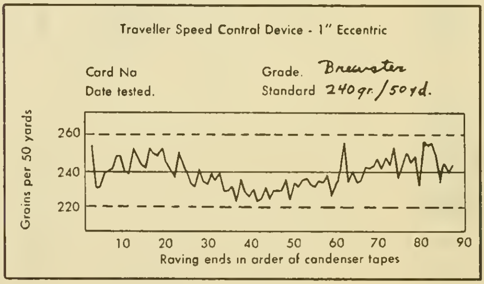


CHART H

8 As substantiation that this device has the desired effect upon the weights across the card, Chart H shows the characteristics with the eccentric set at 1 in. There is a noticeable downward bow in the middle.

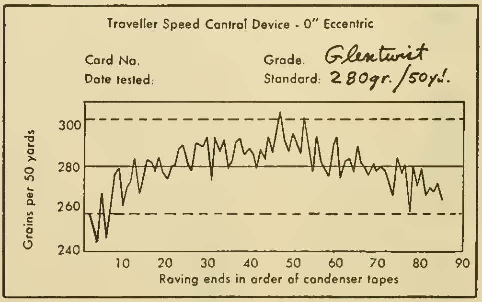


CHART I

9 Finally, Chart I shows the results of setting the eccentric at zero in., or in the concentric position, at which adjustment the characteristic duplicates that of the card before the installation of this control.

The use of this device has resulted in a reduction in roving variation of approximately 50%. It would be unnecessary to describe in detail the advantages of this increased uniformity both from a product and a cost point of view.

How PIN DRAFTERS *Are Being Used*

▶ Hailed as one of the most important advances in decades, the pin drafter is proving itself in several worsted-mill applications. Here are the details on today's costs.

By MICHAEL J. KOROSKYS
Assistant Professor, Wool Department,
Lowell Textile Institute

WORK LOADS →

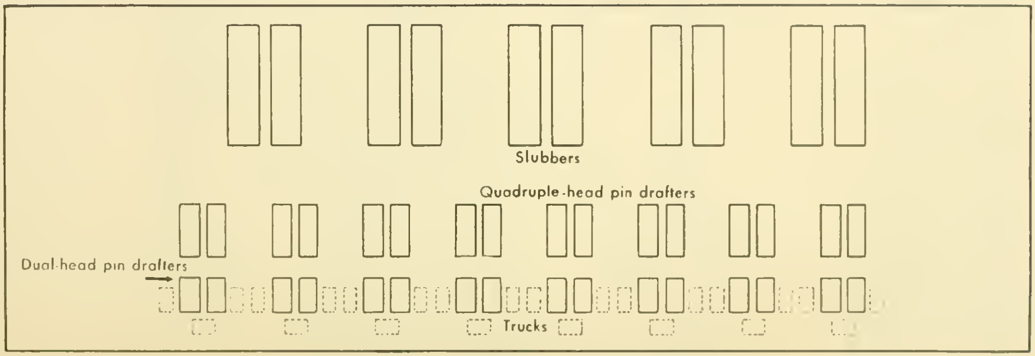
HERE'S HOW THREE MILLS broke down their work assignments. Information about operations after pin drafting is given so you can get a better idea of the entire picture.

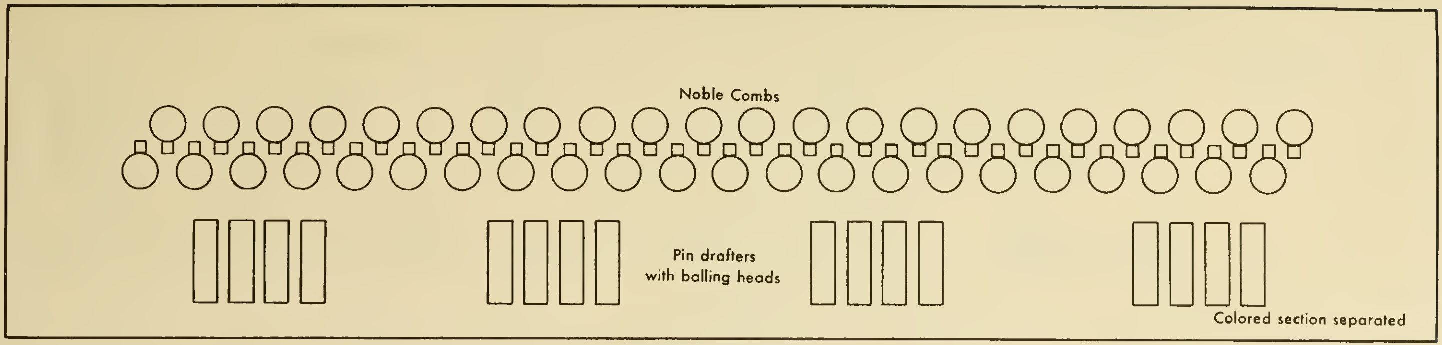
For the pin drafters, each operator usually has a combination of duals and quads. An operator with a small set matches up and weighs the cans.

	MILL A	MILL B	MILL C
PIN DRAFTERS	3 operators to 10 or 12 deliveries. From combed sliver or top. 1 section hand to 1 set, including reducers and rovers.	1 operator to 8 deliveries. From top. 2 section hands to 6 sets, including reducers and rovers.	1 operator to 12 deliveries. From top. 1 section hand and 1 helper to 36 machines.
REDUCERS	1 operator to 2 reducers. Does own creeling and doffing. 10x5 ring 1,110 rpm. $1.38/hr., ⅔ bonus	1 operator to 2 reducers. Does own creeling and doffing. 8x4 ring 1,110 rpm. $1.28/hr., ⅓ bonus	1 operator to two 68-sp. reducers. 2 creelers per 10 machines. 2 doffers per 5 machines. 8x4 flyer 1,110 rpm. $1.066/hr., day pay
SPINNING FRAMES	4 sides per operator for 20s and under. 5 sides per operator for over 20s. Does own doffing. 1 girl as bobbin setter. Yarn girl puts up roving for 16 frames. $1.095 ring; $1.24 cap	4 sides per operator, all counts. $1.20	3 sides per operator for under 21s. 4 sides per operator for 21s and over. $1.196

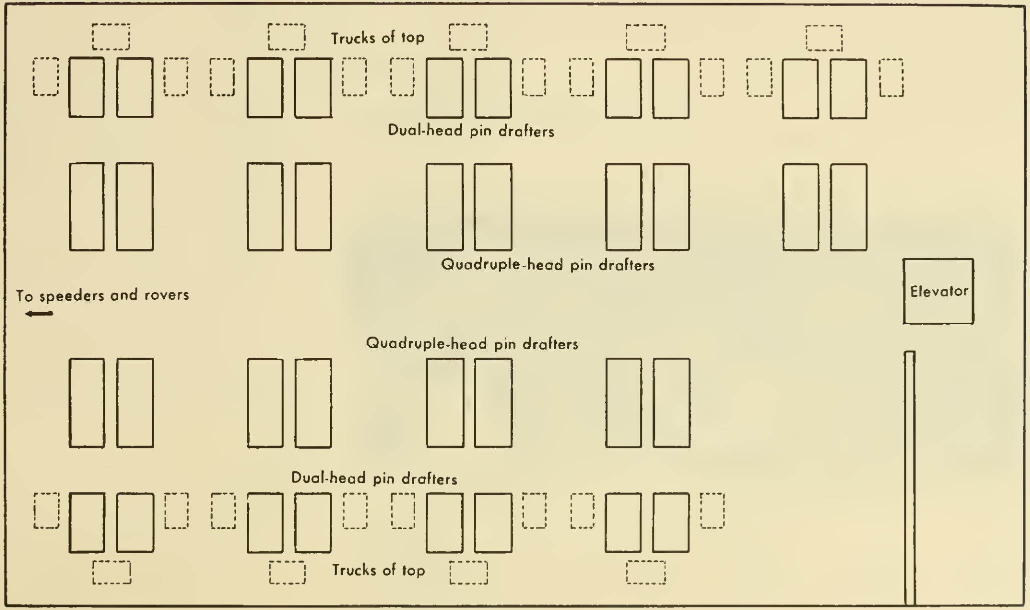
FLOOR PLANS →

IN THIS FRENCH-DRAWING INSTALLATION, balled top arrives in trucks (shown in dotted outline) at the dual-head pin drafters. After processing in this row has been completed, the cans of stock are matched for weight and are then processed in the second row of pin drafters—quadruple-head units. Cans from the "quads" are pushed across the aisle to the slubbers or finishers.





IN A COMBING ROOM, a row of pin drafters is placed behind a row of Noble combs. Balling heads are used on these pin drafters. The extra floor space between sections of pin drafters was made possible when the first and second finishers were taken out. The pin drafters didn't take up so much room. The colored section is preferably located apart from the main combing section.



IN AN ENGLISH-DRAWING SET-UP, trucks of top are brought from the elevator to the "duals." The duals feed the quads, and cans from the quads are trucked to the speeders and rovers in the next room. Path of the stock is from the two sides of the room toward the center, then laterally to the next process.

Turn to the next page and see how four leading worsted mills using pin drafters laid out their production details and figured their costs per pound.

LAYOUTS

1/24s — French

Drawing

Operation	Ends up	Wt. per end (grains)	Wt. fed	Draft gear	Draft Fig.	Draft Act.	Wt. del. Fig.	Wt. del. Act.
Pin drafter								
22 pin	8	115	920	39	7.7	7.2	119	128
22 pin	5	128	640	39	7.7	6.7	83	96
29 pin	5	96	480	37	8.1	8.0	59	60
Slubber	1	60	60	26	5.5	5.7	10.9	10.5
Finisher	2	10.5	21	29	4.9	4.9	4.3	4.3

Spinning

Rim	Center pulley	Pinion	Twist gear	Head twist gear	Draft	Counts	Tpi.	Strength
17	11	43	48	56	8.2	23.80	16.5	61.2

1/35s — French

Drawing

Operation	Ends up	Wt. per end (grains)	Wt. fed	Draft gear	Draft Fig.	Draft Act.	Wt. del. Fig.	Wt. del. Act.
Pin drafter								
22 pin	6	130	780	34	8.8	9.4	88.6	82.8
22 pin	5	82.5	412.5	39	7.7	7.0	53.6	58.6
29 pin	5	59	295	37	8.1	7.4	36.4	40.0
Slubber	1	40	40	25	5.7	5.9	7.0	6.8
Finisher	2	6.8	13.6	29	4.9	5.0	2.8	2.7

Spinning

Rim	Center pulley	Pinion	Twist gear	Head twist gear	Draft gear	Draft Fig.	Draft Act.	Counts	Turns	Strength
17	11	47	52	56	47	7.7	7.6	34.88	11.2	36

1/32s—English

Drawing

Operation	Ends up	Wt. per end (grains)	Wt. fed	Draft gear	Draft Fig.	Draft Act.	Wt. del. Fig.	Wt. del. Act.
Pin drafter								
22 pin	5	120	600	34	8.8	8.5	68	71
29 pin	5	71	355	35	8.6	8.1	41	44
Cone reducer	1	1,760	1,760	31	6.2	5.9	284	300
Cone reducer	2	300	600	41	5.9	6.0	102	100

Spinning

Head twist gear	Draft gear	Draft	Counts	Turns	Strength
33	38	6.4	31.20	12.8	40.25

1/43s — English

Drawing

Operation	Ends up	Wt. per end (grains)	Wt. fed	Draft gear	Draft Fig.	Draft Act.	Wt. del. Fig.	Wt. del. Act.
Pin drafter								
22 pin	8	96	768	44	6.8	6.1	113	126
22 pin	4	126	504	40	7.5	7.6	67	66
29 pin	4	66	264	40	7.5	7.3	35.2	36
Cone reducer (68-sp.)	1	1,440	1,440	33	5.8	6.1	248	235
Cone speeder (80-sp.)	2	235	470	40	6.0	5.9	78	80

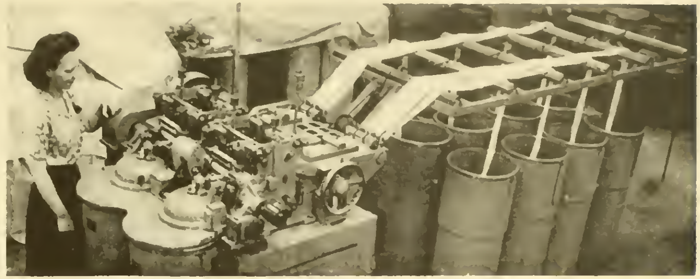
Spinning

Draft gear	Counts	Turns	Strength
53	42.70	15.5	23.5

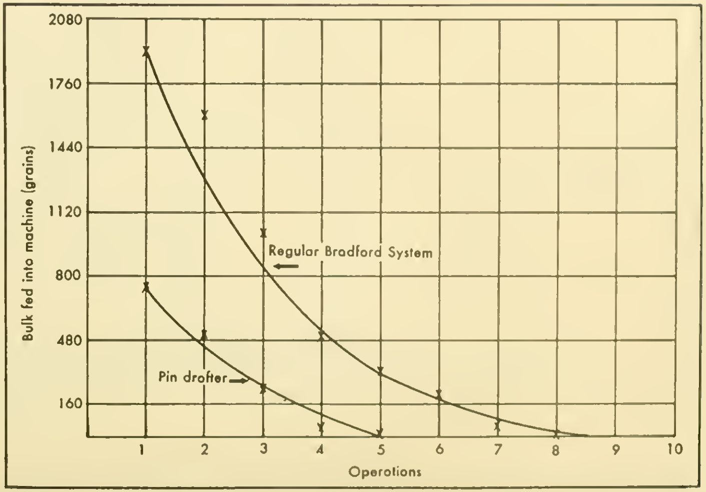
PRODUCTION *

	1/24s	1/32s	1/35s	1/43s
1st operation	141.94	92.58	120.34	118.50
2nd operation	98.74	54.78	63.64	77.76
3rd operation	74.06	—	45.52	40.74

*All figures in pounds per hour per dual pin drafter at 100% efficiency.



POWER-DRIVEN CREEL of pin drafter pulls stock from cans placed directly under the creel.



SHORT-CUT METHOD FEEDS LESS BULK ORIGINALLY but reduces size at about the same rate as the conventional method. This improvement is made possible by better fiber control on the pin drafter.

ACTUAL COSTS PER POUND

Operation	1/24s French Conventional	1/24s French Pin drafter	1/35s French Conventional	1/35s French Pin drafter
1st finisher	$0.009	—	$0.009	—
2nd finisher	0.009	—	0.009	—
Mixer	0.005	—	0.005	—
Comb ball winder	0.006	—	0.006	—
1st drawing	0.005	—	0.005	—
3rd drawing	0.005	—	0.005	—
Reducer	0.005	—	0.005	—
Top carriers	—	0.001	—	0.001
Pin drafting				
1st operation	—	0.004	—	0.005
2nd operation	—	0.006	—	0.009
3rd operation	—	0.007	—	0.012
Slubber	0.010	0.010	0.010	0.010
Rover	0.014	—	0.015	—
Finisher	0.016	0.016	0.015	0.015
Total	0.084	0.044	0.084	0.052
Operations	10	5	10	5

Operation	1/32s English Conventional	1/32s English Pin drafter	1/43s English Conventional	1/43s English Pin drafter
1st finisher	$0.009	—	$0.009	—
2nd finisher	0.009	—	0.009	—
2-sp. gill box	0.009	—	0.009	—
1st drawing — 4 sp.	0.009	—	0.009	—
Weigh box — 6 sp.	0.009	—	0.009	—
Finisher — 10 sp.	0.009	—	0.008	—
Top carriers	—	0.001	—	0.001
Pin drafters				
1st operation	—	0.006	—	0.005
2nd operation	—	0.010	—	0.007
3rd operation	—	—	—	0.013
Cone reducer — 68 sp.	0.017	0.017	0.017	0.017
Speeder — 80 sp.	0.045	0.045	0.058	0.058
Misc.	0.004	0.004	0.004	0.004
Total	0.120	0.083	0.132	0.105
Operations	8	4	8	5

HOW COSTS WERE FIGURED

Elements per cycle (one truck load — 750 lb.)

Elements	Minutes per occurrence	Occurrences	Minutes/Cycle
Position truck	0.31	1.0	0.31
Creel dual ball	0.50	37.5	18.75
Doff dual (2 cans, 14 lb./can)	0.90	26.8	24.12
Weigh two cans	0.72	26.8	19.30
Match set	2.00	5.4	10.80
Creel quad (can)	0.50	53.60	26.80
Doff quad (4 cans, 18 lb./can)	1.80	10.40	18.72
Piece up	—	—	14.00
Clean laps	—	—	14.00
Total work min./cycle			146.80

Estimated Production (15% allow.)

4.69 hr./cycle x 60 min./hr. = 281.40 min./cycle

$$\frac{0.85 \times 480 \text{ min.} \times 750 \text{ lb./cycle}}{281.4 \text{ min./cycle}} = 1087.4 \text{ lb./8 hr./operator}$$

Machine Efficiency — Dual

$$\frac{125 \text{ gr./yd.} \times 9 \text{ yd./min.} \times 60 \text{ min.} \times 6 \text{ ends} \times 2 \text{ hds.}}{7{,}000 \text{ gr./lb.}} = 115.7 \text{ lb/hr.} - 100\% \text{ prod.}$$

$$\frac{80 \text{ lb./hr. (anticipated)}}{115.7 \text{ lb./hr.}} = 69.1\% \text{ efficiency required}$$

Machine Efficiency — Quad

$$\frac{84 \text{ gr./yd.} \times 9 \text{ yd./min.} \times 60 \text{ min.} \times 5 \text{ ends} \times 4 \text{ hds.}}{7{,}000 \text{ gr./lb.}} = 129.6 \text{ lb./hr.} - 100\%$$

$$\frac{80 \text{ lb./hr. (anticipated)}}{129.6 \text{ lb./hr. (100\%)}} = 61.7\% \text{ efficiency required.}$$

Cost Per Pound

$$\frac{\$1.30 \text{ rate/hr.}}{80 \text{ lb./hr. antic./quad} \times 2 \text{ quads}} = 0.008125 \text{ est. cost/lb.}$$

One mill decided to buy pin drafters after making this calculation —

Test run — Pin drafters

1st Operation — 79 lb. per hr. per machine @ 85% eff.
2nd Operation — 47 lb. per hr. per machine @ 85% eff.

Machines Required

$$\text{1st Operation} - \frac{175{,}000 \text{ lb.}}{79 \text{ lb./hr.}} = \frac{2{,}215 \text{ hr./wk.}}{80 \text{ hr. (2 shifts)}} = 27.7 \text{ machines required}$$

$$\text{2nd Operation} - \frac{175{,}000 \text{ lb.}}{47 \text{ lb./hr.}} = \frac{3{,}723 \text{ hr./wk.}}{47 \text{ lb./hr.}} = 46.5 \text{ machines required}$$

Total required, 74.2 machines

Cost of Equipment

74 machines @ \$6,500 = \$481,000

Savings

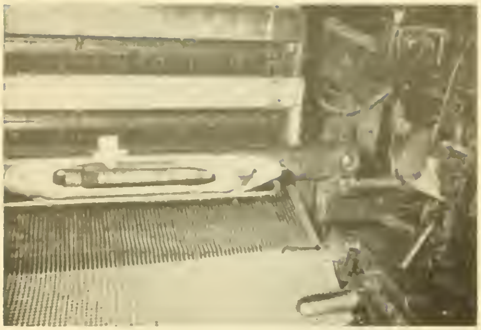
Avg. savings = \$0.03/lb.

Time Required to Pay for Equipment

$$\frac{\$481{,}000}{\$0.03/\text{lb.}} = 16{,}000{,}000 \text{ lb. of production, approx.}$$

175,000 lb./wk. average = 87,500 lb. at 50% mill activity

$$\frac{16{,}000{,}000 \text{ lb. prod.}}{87{,}500 \text{ lb./wk.}} = 183 \text{ weeks production, approx.}$$



FILLING RESERVE of 4½ picks results in bobbins transferring correctly at the loom.

WINDER ADJUSTMENTS to keep filling reserve constant are made by removing the locking stud and adjusting the outside.

What's the Minimum Filling Reserve On C&K All-Purpose Looms?

By EUGENE P. SCHREMP, Consulting Editor, TEXTILE WORLD

CHECKING RESERVE is a part of every winder operator's job. Each spindle should be checked at the start of each shift to insure the 4½ minimum picks.

The number of yards of filling reserve left on the bobbins of Crompton & Knowles all-purpose looms often looks excessive. But cutting down on the filling reserve can cause trouble resulting in broken picks, filling run-outs, and jerk-backs.

For 4x1-Box Operation

With 4x1-box operation, you need a filling reserve of 4½ picks. On 72-in. cloth width at the reed, for example, you need 9 yds. of reserve filling on your bobbins.

Since the filling feeler indicates on the magazine end of the loom, the shuttle must travel to the head end of the loom and back before the magazine transfers the bobbin. Consequently, two picks of filling are used. When the filling transfer is made, there is approximately 2½ picks of filling left on the transferred bobbin as it falls into the bobbin container.

Two and one-half picks, or 5 yds. of filling, seem to be an excessive amount of waste until you consider that all the bobbins do not run out at the exact time the shuttle is picked to the magazine end of the loom. Part of the bobbins will have only a few picks of yarn left, and the feeler will not indicate.

When fewer picks than the minimum of 4½ are left on the bobbins, the shuttle must travel to the head end and back before a transfer occurs. This travel uses two picks of the 4½ picks before the feeler indication is made. Then two more picks of the reserve filling are used. At the time of the transfer, there is about one-half pick of reserve filling still left on the bobbin. This reserve is important to prevent broken picks that result from run-outs.

Too little reserve filling may also leave the loose end of the filling in the shuttle eye and cause the filling end to be woven into the cloth as a drag-in or double pick.

Loom production cannot be maintained at a high level unless there is sufficient reserve of filling on the bobbins, because filling run-outs cause looms to stop; then the weaver has to change the filling manually and restart the loom.

For 4x2-Box Operation

When the loom is changed to operate as a 4x2 loom using three shuttles for mixing the filling, a 4½-pick reserve is still necessary.

In 4x2 operation, the filling indicates on an empty bobbin when the shuttle is picked into the top box cell of the magazine-end shuttle box. The transfer is completed before the shuttle is picked again.

At the time of transfer, 4½ picks of filling are still left on the bobbin. This is two more picks of waste than is normally left on a routine transfer of a loom in 4x1 operation. But all bobbins will not be depleted just at the time the shuttle is picked into the top cell of the shuttle box.

When only a few rounds of yarn on the bobbin prevent a transfer at the usual 4½ picks, the shuttle has to be picked to the head end and back to the bottom cell of the magazine-end shuttle box. A feeler indication at this position is impossible, and the shuttle has to be picked back to the head end and returned to the top cell of the magazine-end shuttle box. This action uses a total of four picks of filling and uses all but one-half pick of the filling reserve.

Filling bobbins with less than 4½ picks will certainly cause broken picks, run-outs, and drag-ins.

The filling-reserve building mechanisms on winders should be adjusted to keep the filling reserve on bobbins constant.

Operators on stationary-type winders should check each spindle at the start of each shift to be certain the proper reserve is being wound. On automatic traveling-spindle winders, bobbins should be checked frequently to be sure the necessary reserve yardage is being wound.

REQUIREMENTS FOR WOOL TOPS													
Grade	80s	70s	64s	62s	60s	58s	56s	50s	48s	46s	44s	40s	36s
Fineness Range, microns:													
Min.	18.1	19.6	21.1	22.6	24.1	25.6	27.7	29.1	31.6	33.3	34.8	36.6	38.8
Max.	19.5	21.0	22.5	24.0	25.5	27.0	29.0	31.5	33.2	34.7	36.5	38.3	41.3
Fibers, percent:													
10 to 20 microns, incl., min.	60	50	36	72	18	16	9	4					
10 to 25 microns, incl., min.	92	84											
10 to 30 microns, incl., min.			94	88	83	74	64	45	34	26	22	16	12
10 to 40 micarns, incl., min.									77	70	63	55	44
25.1 to 30 microns, incl., max.	8												
25.1 to 40 microns, incl., max.		16											
30.1 to 40 microns, incl., max.	0.25	2	6	12	17								
30.1 to 50 microns, incl., max.						26	36	55					
40.1 to 50 microns, max.		0.25	0.33	0.50	0.50	2	5	10					
40.1 to 70 microns, max.									23	30	37	45	56
50.1 and over microns, max.						0.75	1	1.25					
60.1 to 80 microns, incl., max.									2	2	3	4	4
Minimum number of fibers required for test, per sample	400	400	600	600	800	800	1000	1000	1600	1600	1600	1600	1600

COMPLETE MICRON MEASUREMENT for each quality from 80s to 36s is shown here. As an example, the range for 60s is 24.1 to 25.5, which means that any top, to be a 60s, must have its average micron measurement fall between these two limits. Various percentages of thicknesses allowable in a given top, as well as minimum number of fibers required for testing each grade, are shown.

Accurate Techniques Necessary For WOOL-TOPS Analyses

- Canadian Wool Co. Ltd. regularly compares its wool-top quality with industry-accepted standards by a routine laboratory procedure
- Sampling and testing methods must give full fiber variance representation to any lot of tops under examination
- Results are expressed in microns (0.001-mm. units) and plotted in graph form for comparative purposes

By **ROBERT E. BIGGIN**, Canadian Wool Co. Ltd.

The accompanying information will help any mill meet its wool-tops requirements in the U. S. market. It should be carefully noted that the standards given are for U. S. requirements only, as Bradford and American qualities are not the same.

Bradford qualities, not being quite in line with American, are a little difficult to convert; but the job can be done if one has knowledge of the equivalents. These latter are obtained by accurately micron-measuring Bradford quality tops of a known and recognized standard and working from them.

Crossbred wools are much further apart than merinos, of course, and this fact must be borne in mind when using these figures on a comparative basis.

Sampling Techniques

To insure full representation of any lot of top, test samples comprising two or more sections of sliver, each at least one yard long, should be selected. Note that the term "lot" refers to a single combing lot or portion thereof, while the test method in general follows that published by the ASTM under designation D472-47T.

Size of Lot	*No. of balls sampled*	*No. of test samples*
5,000 lb. & under	2	1
5,000 to 20,000 lb.	3	1
20,000 lb. and over	3 for ea. 20,000 lb.	1 for ea. 20,000 lb.

In conclusion, a mill or laboratory should keep in mind that the mechanical testing of the wool tops is a good guide only, and reliable only when accurately performed. For it is possible for a top to have a percentage of low fibers in it great enough to affect the micron result seriously, yet the spinning qualities of the top may be very good.

Visual and "handle" examination in conjunction with mechanical testing, therefore, is essential. Anyone who rejects a top purely on micron count is penalizing that top unless other unfavorable conditions present themselves too.

Equipment That Should Be Available for the Mechanical Testing of Wool Tops

. . . . for Fiber-Diameter Testing

1. Bausch & Lomb VH Fiber Projector
2. A darkened booth with a firm, absolutely level table for mounting the projector on.
3. Electrical outlets to deliver current to the projector and ventilating fan.
4. A hand tally counter for keeping track of the number of fibers measured.
5. An ample supply of cardboard wedge rules, printed from a master engraving.
6. A good supply of well-sharpened pencils.
7. A supply of glass slides 25x75 mm., and cover glasses in the same size. These cover glasses must be ½-oz., wafer thin.
8. A supply of clear, white mineral oil, for fiber immersion, with no moisture content.
9. Pipettes for dropping oil on slides.
10. A large Hardy cross-section device, for the making up of a large bundle of fibers embracing the entire width of wool-top sliver so the operator can slice off in uniform lengths full representation of every fiber in the sliver.
11. A generous supply of new razor blades for slicing fiber bundles from the Hardy device. A new blade should be used for every slide prepared.
12. A large needle. The fibers dropped from the cross-section device must be properly dispersed in the immersion oil.

. . . . for Fiber-Length Testing

1. A Suter fiber length sorter.
2. An analytical scale capable of weighing from 1/10 of a milligram to 200 g. with auxiliary weights to augment these. An ideal scale in this instance is a Chain-O-Matic scale, with vernier readings in a tenth of a milligram.
3. Screw-cap bottles for holding draws from the fiber sorter. About 25 of these required.
4. A supply of weight and cumulative percentage lift sheets.
5. A supply of graphs for transposition of results to graph form.
6. Three small black velvet-covered boards.
7. A pair of fine scissors.
8. A frosted-glass screen, illuminated from behind for comparison of length graphs.

Factors that Affect Accuracy in Diameter and Length Testing

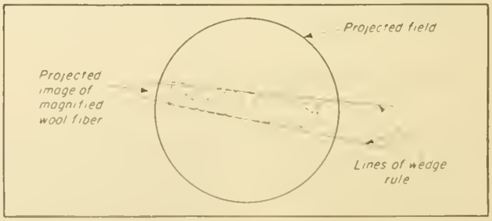
1. Human error
   a. Not sampling the lot of top representatively.
   b. Misuse and misinterpretation of the wedge rule.
   c. Incorrect focusing of the equipment.
   d. Miscalculation of the averages.
   e. Not having the machine correctly calibrated.
   f. Using dirty slides and equipment.
   g. Attempting shortcuts.
   h. Overtaxing the eyes.
2. Incorrect immersion oil
   a. Colored oil, such as cedarwood, should not be used.
   b. A clear mineral oil with no moisture content must be used because its viscosity is constant and the oil does not get gummy.
3. Slides and cover glasses
   a. These must be of uniform size and of good quality.
   b. When placing the slide in the fiber projector, the operator must place the cover glasses down toward the projected field.
4. Measurement of fiber
   a. The fiber must be measured within a 4-in. circle in the center of the projected field, eliminating the chance of distortion from aberration.
5. Calculation
   a. This must be done only by prescribed methods, without "shortcuts."
6. State of top
   a. Top should, for length testing, be "set," as *fresh* top tends to curl up and creep back into the faller pins of the fiber sorter.
   b. For micron testing, *white tops only* must be used, for dye increases the fiber diameter considerably and in darker shades diameter is more pronounced.
7. Condition of the blending wool
   a. A top made from soundly grown wool will be more accurately measured than one made from inferior wool.
   b. In poorly grown wools, the fiber diameter can vary from one end to the other as much as 100%; so excessive quantities of badly tipped fibers may swing results one way or the other.
8. Humidity
   a. The results of micron testing from laboratory with a 50 to 55° r.h. will never agree accurately with those from a properly humidified laboratory with 65° r.h., for wool is very hygroscopic.

Recommended Method of FIBER-DIAMETER Testing

1. Draw your samples of sliver from the lot of the top to be tested.
2. Lock yarn test sample in the slot of a large Hardy cross-section device.
3. Trim off projecting fibers flush with upper and lower surfaces of holder plate.
4. With the propulsion mechanism, extrude the fiber bundle about 150 microns.
5. Prepare a clean glass slide and apply several drops of mineral oil to it.
6. Slice off projecting bundle of fibers with a new razor blade.
7. Drop cuttings in the oil on the slide, then disperse with the aid of a large needle.
8. Drop a cover glass on the test slide after dispersion is complete.
9. Slip slides into the fiber projector, cover-glass down, and inspect. If dispersion is insufficient, prepare a new slide.
10. Turn on the projector and begin measuring at the right-hand corner of the slide farthest away from the operator. Work the slide in a zig-zag manner, ensuring full coverage of it.
11. Focus fibers on the projection table, which should have a white cardboard surface, non-glazed, to project the image on.
12. Place the wedge rule along the lines of the fiber, and make a pencil dot impression on the wedge rule at the point where the lines of it coincide with the lines of the two edges of the fiber being measured.
13. Continue measuring fibers until the required number has been reached. The number of fibers required for test, per sample, to obtain full representation, are as follows:

80s and 70s	400 fibers
64s and 62s	600 fibers
60s and 58s	800 fibers
56s and 50s	1,200 fibers
48s and below	1,600 fibers

14. Tabulate results of the required number of tests on the back of the micron card, using the calculation basis printed thereon.
15. Calculate your fiber distribution by totaling the number of fibers measured on the card and expressing the number of fibers in each group as a percentage of this total. In other words, if you have 50 fibers from 10 to 20 microns out of a total of 200 fibers, 10 to 20 microns fiber distribution would be 25%; and if in the 20 to 25 micron groups you had 10 fibers, you would have 5% in this micron group. And so on.



A WEDGE RULE is used to measure diameter in microns of individual wool fibers. Where the lines of the wedge rule coincide with the edges of the fiber is where a pencil dot is put on the rule. The number of microns of width is determined through the use of a micron card that shows the particular fineness group in which the dot is located.

Check These Tips for Running SYNTHETICS on Wool Systems

▶ Almost any information on running synthetics on machines built for wool fibers is useful. Here are some tips that aren't intended to be the last word, but they make a good checklist for you to compare your own experience against.

By M. J. KOROSKYS, Assistant Professor, Wool Dept., Lowell Textile Institute

The optimum conditions for running wool haven't been determined—much less the optimum conditions for the new synthetics. Synthetics have less variation in denier and length, but they are being processed on machinery designed for a wool fiber, which has serrations that give better interfiber friction and crimp that gives a better grip between parallel groups of fibers.

Evenness tests usually run higher on synthetics than wool because we know less about how to process them. The exact relationship between the evenness expected on wool vs. synthetics is a matter of conjecture.

Here Are Some Tips

CARDING

Most synthetics have been run through an opener before leaving the producer's plant; so you do not need much carding action. An antistatic agent has been added and crimp has been put into the staple fiber. Overcarding will tend to pull out the crimp and cause more difficulty in subsequent operations.

Severe carding will also cause the fiber to elongate, and heat processes in later operations may then relax the fiber. An extreme case of elongation can produce an unintended seersucker effect, especially in blends with unevenly shrinking components.

Open settings may cause rolling and neps.

Air currents, such as those caused by using a fancy on flexible clothing, may cause rolling and create neps in the sliver.

Loading the card will cause neps.

GILLING

In general, on the first few gilling operations, the ratch on the gill box should be opened up. Open the front ratch to 2¾ in. on stock that varies from 6 in. down.

An antistatic roll, oil, and/or bar are helpful in gilling and further operations. These aids are especially needed on three-roll nips with rubber rolls. The percentage of oil used is critical. Moisture changes will play havoc with the drag (interfiber friction).

Too much twist used in open drawing will cause the end to "burn through."

Too little ratching will cause delayed creep that makes the yarn heavier a week after you spin it.

Temperature-sensitive fibers will soften if too much pressure is used on drawing rolls.

A slight decrease in speed will sometimes lick a balky operation, especially on old equipment.

DYEING

Stock is top-dyed in the worsted system and rawstock-dyed in the woolen system. Gilling of the dyed sliver increases the difficulty of getting a good dye. Some of the faults found are hard spots in the sliver, excessive dye, shady spots, distorted sliver from blowing, and channeling.

These problems make it more difficult to get as even a sliver from dyed stock as from natural stock. However, dyeing techniques are being developed that should overcome some of the present difficulties.

A Recommended Method of FIBER-LENGTH Testing

1. Select a yard-length representative sample of the top and lay it on the full length of the machine, on the right-hand faller bars with the longer pins. Sliver should not exceed 1½ in. in width. The small combing bar should be swung out and locked in place.

2. Tamp carefully, with the aid of the tamping device, the top sliver down to the bottom of the faller pins, leaving a projection of about 1½ in. out the front of the first row of pins. Then draw and repeat until an even edge extends 1 in. beyond the first faller bar.

3. With the aid of the clamp supplied with the machine, take thin draws carefully, not letting the "bite" of the clamp exceed 1/16 in. Take draws through the small comb twice to comb it out straight. Lay them on the shorter pins of the left-hand side of the machine, after drawing through the full length of the bars, until the clamped ends of the fibers reach the front faller bar. The draw should then be carefully pressed down with the tamper so as not to crimp the fibers in the pins, and the next draw taken.

4. When a good-size weight has been reached, probably requiring about a full gram of fibers (about twenty draws), the intersecting faller bars should be dropped into place at the front end of the machine in the slots provided, and testing commenced.

5. The movable bar that holds up the faller bars should be drawn out slowly, allowing the faller bars to drop slowly from the rear of the machine until a point is reached where fibers are projecting from them.

6. All fibers that project should be drawn out with the aid of the clamp, rolled into a small ball, and dropped in a screw-cap bottle marked clearly with the length—for example, 6 to 6½ in. The movable bar should be moved one more faller, allowing it to drop. At this point you will be presented with projecting fibers ranging say, 5½ to 6 in. These should be placed in a bottle marked correspondingly.

7. Progressively, every faller bar is dropped. This procedure is followed all the way down, at which point the intersecting upper faller bars are carefully extracted as reached.

8. The bottles should be lined up commencing with the highest length figure. With the aid of a pair of tweezers, the small ball of wool, which may only amount to two or three fibers, should be placed on the pan of the scale and weighed in milligrams. The weight of each group should be registered on a fiber-length analysis sheet and totaled.

9. The percentage of the total should be made for each group, and then these percentages should be taken in the next column and made cumulative. When the cumulative percentages are calculated, they can readily be plotted in graph form to give a visual full-length analysis.

10. Comparison of different tops may be made by placing one graph upon another on top of a frosted-glass illuminated screen.

Pin Drafters and Bradford Reducers—A Cost-Saving Combination

▶ The president of a live-wire Canadian worsted-spinning mill tells how he has been able to realize manufacturing savings without hurting his yarn quality.

▶ A system of three-operation pin drafting that ties into a reducing operation with 120 doublings instead of 240 has given best results.

By FRANCOIS CLEYN

President, Spinners Ltd., and Consulting Editor, TEXTILE WORLD

In our mill we were sold on the merits of pin drafters right from the beginning, but we wondered about (1) how many machines we should have per set and (2) the best method of running pin-drafter sliver on into the Bradford reducers.

We decided to purchase four machines per set, and we operated the set as follows:

First Operation	Second Operation	Third Operation
1 machine	2 machines	1 machine
2 deliveries	2 deliveries each	4 deliveries

Obviously the number of machines required depended on the weight of the top to be processed, the layout, and the type of material to be used. We wanted to spin yarn ranging from 1/30s to 1/36s in 60/64s quality.

We started our operations with a standard layout:

	First Operation	Second Operation	Third Operation
Ends	4	5	5
Draft	7.8	8.2	8.2
Grains per 40 yd.	5920	3600	2200

We Change the Procedure

At this point, one box used for the second operation was taken out of the set. To maintain production, we had to revise our layout as follows:

	First Operation	Second Operation	Third Operation
Ends	5	6	4
Draft	8	7.9	8.1
Grains per 40 yd.	5900	4500	2200

The total number of doublings was able to be increased by purchasing a top weighing only 9,000 gr. per 40 yd.

On the reducing operation, we used a Prince-Smith 10/5 ring reducer. After trying various methods, we adopted the following as the most satisfactory arrangement:

1. The sliver is drawn from the cans by using an overhead creel, and is fed into the back rollers by passing through a condenser tube. The condenser tube enables us to feed the sliver directly into the nip of the bottom back roll and the intermediate back roll instead of following the conventional method of passing the sliver over the top back roll and around the intermediate back roll.

2. The sliver then passes through a single row of carriers and is kept in its condensed state by having a riding fork over the carriers, and then it enters the nip of the front rolls.

3. We found that best results were obtained by taking the bottom carrier roll out of gear and letting the top carrier roll turn by friction only. Despite the condensation of the sliver achieved by the condenser tube and the riding fork, we were still able to draft a sliver without twist.

4. This condition makes a very short ratch necessary. We found that proper ratching is extremely important on this operation. Often one-quarter of any inch, one way or the other, can make a big difference in the evenness of the sliver. We found that each lot had to be checked with an evenness tester before starting.

5. We also discovered that the weight of the top carrier roll is important and can substantially alter the evenness results. For good-length 60/64s tops, we found iron rollers weighing 1½ lb. to be satisfactory. For shorter and more brittle stock, wooden carriers gave better results.

After describing this operation in some detail, we have to admit that under the best of conditions it is still a crude method. It is at this point that fiber control is at its worst.

How Many Doublings?

This situation brought on our next problem: Was it better to adopt what we called Layout "A" with its 240 doublings, or Layout "B" with only 120 doublings?

We have come to the conclusion that it is more advantageous to sacrifice the additional doublings of Layout "A" and to run the reducing operation with a very low draft, as shown below in Layout "B".

LAYOUT A

	First Pin Drafter	Second Pin Drafter	Third Pin Drafter	Reducer	Rover
Ends	5	6	4	2	1
Draft	8	7.9	8.1	5.9	6.2
Grains per 40 yd.	5900	4500	2200	750	120

LAYOUT B

	First Pin Drafter	Second Pin Drafter	Third Pin Drafter	Reducer	Rover
Ends	5	6	4	1	1
Draft	8	7.9	8	3	6.2
Grains per 40 yd.	5900	4500	2250	750	120

Conclusions

The advantages of Layout "B" are obvious from the standpoint of economy and efficiency. An operator can look after more spindles, and there is a great saving in waste produced. If Layout "A" were selected by a mill, it would be advisable to have a stop motion on the reducer creel in an effort to duplicate the waste saving achieved in Layout "B".

To date in technical literature, not much stress has been laid on the waste saving that is now possible with pin drafters compared to conventional Bradford drawing. We think that this saving is still another important feature of pin drafting.

An Industry-wide Basis Should Be Adopted To Take Advantage of Pin-Drafter Savings

▶ **Pin drafters are here to stay. So as worsted manufacturers we should ask ourselves several important questions.**

1. If the place of the pin drafter is after the comb, why don't spinners order 50-gr. sliver instead of the conventional top?

One pin-drafter operation at the comber would be less expensive than the present two or three gillings, and would certainly be more useful to the spinner.

2. Wouldn't it be logical for top dyers to offer the same service to spinners?

To take full advantage of pin drafters, a long-draft reducing or roving operation has to follow pin drafting. For low counts it is a problem easily solved. If drafts of 15 to 16 can be obtained in this intermediary operation, there is no further need for long-draft spinning.

If, on the other hand, finer counts are to be produced, it is necessary to have an intermediate process that provides for drafts between 20 and 25. Or else it is necessary to have long draft on both drawing and spinning; or alternatively, sufficiently long draft in spinning to achieve the reduction.

3. Don't worsted manufacturers want to reduct costs?

It seems obvious that as a manufacturing group we want to progress and reduce costs. Any new development like this should be on an industry-wide basis. Every plant has to make savings, but it is even more important for worsted manufacturers to make an over-all saving as a group, in whatever stage of processing it is possible.

Kinks and Short-Cuts

We Use False Reeds To Reduce Worsted Mending

On some fine worsted cloths, we were bothered with two or more warp ends drawn through the same dent in the reed rolling together between the harnesses and the reed so that the ends would not separate when the warp shed opened. As a result we had to mend the woven cloth.

Now we use a false reed to separate the warp ends. We space the wires so that one wire is between the ends of every two dents of the reed.

The false reed is made from fine spring-steel wires (17 gauge). The wires are 9½ ins. long and have an eye at one end. They are strung on a 6-gauge wire that is bent into a hook at each end, and the hooks are stapled to the back of the handrails of our looms. The wires are also stapled to the handrail of the loom at two other places.

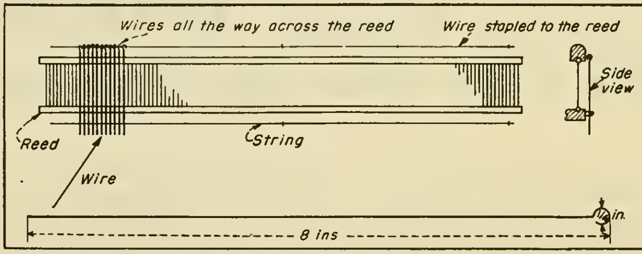
After the wires are stapled to the handrail, they are dropped between the warp ends by hand.

The bottoms of the wires are held in place with a heavy cord run through the eyes of the wires and strung across the false reed underneath the warp A spring is fastened to one end of the cord and to the back of the lay to keep tension on the wires.

As the lay moves back and forth, the false-reed wires keep ends that formerly stuck together separated.

The false reed has eliminated most of our stitchings and, therefore, has reduced our mending costs. Loom production is higher too. *A. Keith Fawcett, Huntingdon, P. Q.*

False Reeds Make It Easy To Weave Fuzzy Yarns



THE FALSE REED fastens back of the handrail. The wires separate two or more ends drawn through the same dent in the reed to keep them from rolling together.

We used to have a lot of trouble weaving gabardines, poplins, etc. from loosely twisted cotton yarns. The trouble was the ends drawn through the same dent in the reed stuck together and made warp skips in the woven cloth.

Now we use false reeds to completely solve the problem. *H. J. Armstrong, Yorkshire, England*

[False reeds are certainly valuable in weaving cloths where warp ends drawn through the same dent in the reed have a tendency to stick together or roll together. But false reeds made to do the job right are available from regular heddle manufacturers.

The manufactured false reeds must be cheaper, too, than make-shift ones.

Regular false reeds have substantial frames that can be securely fastened to the top of the handrail with regular handrail bolts. They don't have to be fastened at the bottom.

The false reeds are placed in the warps by drawing-in hands as warps are drawn in.

In emergencies, the false reed can be placed in the warp while the warp is on the loom.—Editor]

Crabbing Depends Upon Dye Fastness

Technical Editor:

What is good mill practice for crabbing all-wool men's worsted suiting? How long is the cloth boiled in each of the water baths, and how long is it steamed? (9781)

The boiling and steaming times are determined by the structure of the cloth and the fastness of the dyes. If the dyes are fast and the cloth needs thorough setting, two boilings of 2 mins. each, followed by two steaming periods of 6 mins. each with steam at 30 psi., would give a good set.

If the dyes are not fast to boiling, the temperature of the first two treatments should be as high as is practical, and the steaming should be omitted. Some finishers, however, recommend an initial steaming. This method is claimed to fix some dyes and is usually followed by a wet treatment.

What Do You Know About Unevenness?

After you've made tests for unevenness, what do you have? How can you analyze such data? Under what conditions can such results be compared? Does length have more effect on unevenness than fineness? Is there such a thing as standard unevenness, with so many mill variables?

The two articles here are an approach to the answers to some of these questions. The articles are based on material presented at a recent meeting of the Textile Quality Control Assn., a young organization that is making a real contribution to the understanding of problems such as the one of evenness.

Average Percent UNEVENNESS— We Know What the Term Means

▶ **This article presents some ideas that may help you to analyze evenness-tester results. Mr. Chandler, with a background in physics, brings us a fresh approach to the origin, significance, correlation, and practical uses of evenness-tester data. His work, done solely with the Pacific evenness tester, should be of interest to those owning this type of tester or other types—and to all mills considering the subject of evenness and its measurement.**

By NORMAN H. CHANDLER, Thor Mills, Granby, P. Q.

GONE ARE THE DAYS when the "old hand" could judge a yarn or sliver for evenness by twisting it up, looking at it, feeling it, or otherwise pronounce a judgment based on some other means of accentuating the irregularity. The textile industry has entered the era of the textile scientist.

Various evenness testers (of which the Pacific is one) recently introduced to the textile trade are capable of continuously amplifying the variations of yarn or sliver cross-sectional area about an average value and permanently recording the amplified fluctuations on a length of chart paper. Subsequent calculations made on the tester chart yield a numerical value proportional to the actual unevenness of the yarn or sliver under test.

But what does this numerical value mean? Is "average percent unevenness" a useful mill tool, or is it just a lot of statistical hocus-pocus?

We at Thor Mills have found unevenness data extremely helpful—especially since we developed a few simple relationships that tell us what we have, how it fits in, and what it means.

We Can Predict Unevenness

Once we have established the average percent unevenness of a given yarn number, we can determine the unevenness of all other yarn numbers spun from the same type of fibers by using the relationship—

$$\text{Average percent unevenness} = \frac{A}{\sqrt{N_o}}$$

A is a proportionality constant

N_o is the average number of fibers in a cross-section

We determine A for our satisfactory yarn and then compute the unevenness we can expect for other yarn numbers.

We Can Measure Machine Effects

The value of our constant A is a direct measure of the harm done to a yarn or sliver by the machine that processed it. The greater the value of A, the more injurious the operation has been. The injury, of course, may have been caused either by the poor drafting quality of the fibers themselves or by faulty machine components or settings.

How do we get the above relationship? Average percent unevenness is a measure of the irregularity produced in the process plus the irregularity due to the random distribution of fibers in the material. But unevenness due to random distribution is dependent only on the average number of fibers per cross-section. Therefore the constant A measures only processing effects.

We Can Compare Products

From our first relationship we developed two others:

$$\text{Average percent unevenness} = \frac{B}{\sqrt{\text{wt. per unit length}}}$$

$$\text{Average percent unevenness} = C\sqrt{\text{yarn number}}$$

Table I
Relative Yarn-Unevenness Increase With Spinning Draft

Yarn number	Spinning draft	Average % unevenness	C
1/6s	7.86	26.2	10.70
1/16.5s	10.83	46.3	11.40
1/20s	13.13	53.6	12.00
1/30s	19.2	70.6	12.90

Table II
Another Example of Effect of Spinning Drafts On Average Percent Unevenness

Yarn number	Spinning draft	Average % unevenness	C
1/20s	9.30	51.6	11.55
1/30s	13.95	67.7	12.55

The above two relationships enable us to compare yarns or slivers of different weights—but still of the same material. Both B and C are also proportionality constants that vary from one fiber to another.

In all cases, the lower the value of the proportionality constant, the less unneven is the yarn or sliver.

Theory and Derivation of the Relationships

Every spinner realizes that unevenness is inherent and can never be totally eliminated. Since the fibers in the yarn or sliver were not placed there individually, the conglomeration of fibers may be defined as constituting a random distribution.

With the aid of probability theory it can be shown that the standard deviation of a random distribution is equal to the square root of the arithmetic mean of the distribution. This theorem along with its vigorous proof may be found in most advanced textbooks on probability and statistical theory.

Rewriting this result in the form of an equation we have

$$\sigma = \sqrt{N_o} \qquad (1)$$

where σ = the standard deviation of a random distribution and

N_o = arithmetic mean of the distribution.

Thus the coefficient of variation V of a random distribution is

$$V = \frac{100\,\sigma}{N_o} \qquad (2)$$

$$= \frac{100}{\sqrt{N_o}} \qquad (2a)$$

Consequently the random distribution of fibers constituting a yarn, sliver, or roving is the source of an irregularity whose coefficient of variation is given by (2a), where N_o represents the average number of fibers in the yarn or sliver cross-section.

That equations (1) and (2) hold for a yarn or sliver of any staple length has been proven by J. G. Martindale who has also altered equation (2) to include the added unevenness in a yarn or sliver brought about by a variation in the fiber cross-sectional area. This latter modification—for the purposes of this article—will not be included.

An attempt will now be made to find some sort of correlation between the value of average percent unevenness and the coefficient of variation of a random distribution. For, should a relationship exist between these two values, then statistical methods may be employed as a further aid in the analysis of results.

Let us consider further the definition of average percent unevenness. We have

$$U = \frac{\text{Total average deviation}}{\text{True average thickness}} \qquad (3)$$

where U stands for average percent unevenness.

If the right-hand expression of equation (3) is multiplied top and bottom by the groove width in which the sample was tested, relation (3) becomes

$$U = \frac{\text{Total average deviation in cross-sectional area}}{\text{True average cross-sectional area}} \qquad (4)$$

Or again, where the fibers are all uniform in cross-sectional area

$$U = \frac{\text{Total average deviation in cross-sectional fiber content}}{\text{True average cross-sectional fiber content}} \qquad (5)$$

Comparing equation (2) (the coefficient of variation of a random distribution) with equation (5) we have:

a. σ, the standard deviation is directly proportional to the total average deviation in cross-sectional fiber content of the sample

b. N_o, the arithmetic mean of the random distribution, is equivalent to the true average cross-sectional fiber content of the sample

c. The random distribution of fibers is a source of unevenness in yarns, slivers, and rovings

In view of relationships a., b., and c., we may deduce that

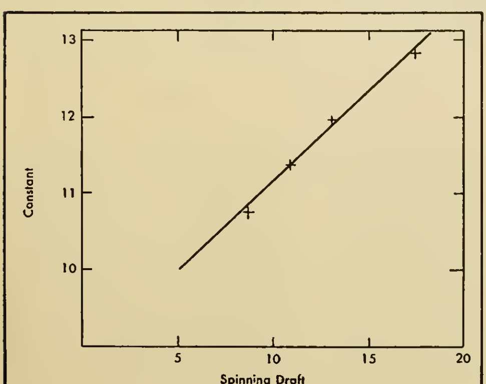
Average percent unevenness =

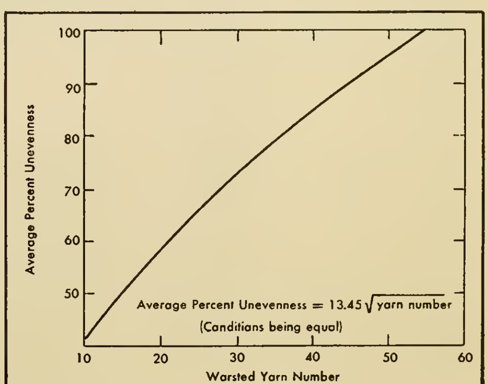
$$U = \frac{A}{\sqrt{N_o}} \qquad (6)$$

A is a proportionality constant and N_o is the average number of fibers constituting the yarn or sliver cross-section.

From equation (6) we see that as the average number of fibers in the yarn or sliver increases, the average percent unevenness decreases; a result that has been noticed undoubtedly by every evenness-tester operator.

Since the average number of fibers in a sliver or roving cross-section is propor-





tional to its average weight per unit length, relation (6) may be written

$$\text{Average percent unevenness} = \frac{B}{\sqrt{\text{wt. per unit length}}} \quad (7)$$

where B is a proportionality constant and the weight per unit length may be expressed as grains per yd., grams per yd., denier, etc.

Again, in the case of yarns, the average number of fibers per cross-section is inversely proportional to the yarn number; that is, the higher the yarn number, the lower the number of fibers in the yarn cross-section.

This leads immediately to equation (8).

$$\text{Average percent unevenness} = C\sqrt{\text{Yarn number}} \quad (8)$$

C is a proportionality constant.

By substituting a series of values of yarn counts and their respective average percents unevenness into equation (8), we can find an average value of C; but it must be kept in mind that the calculated value of C is valid only for the type of yarn for which it was determined. In other words, the value of C for 3-den. staple-rayon yarn is not the same as the value of C for yarns spun from 58s quality wool. This is a logical limitation because the 1/20s yarns in the two cases have an altogether different number of fibers in their cross-section.

If we want to compare the quality of several yarns where each yarn is made up of fibers of a cross-sectional area different from the others, we must use equation (6).

Examples and Applications

Example: Find the value of C for a 1/20s yarn whose average percent unevenness is 60. From equation (5)

$$C = \frac{\text{Average percent unevenness}}{\sqrt{\text{Yarn number}}} \quad (9)$$

$$= \frac{60}{\sqrt{20}} \quad \sqrt{\text{Yarn number}}$$

$$= 13.45$$

With the average values of C determined for the various types, it is a simple matter to plot average percent unevenness against yarn number for the different C's or yarn types. The general nature of such a curve is shown in Fig. 1.

Although we at Thor have verified the preceding theory through extensive tests on various types of yarns and slivers, one may readily ask what has been accomplished by deriving statistically and verifying practically the relations (7) and (8). The answer is that the inevitable yarn or sliver unevenness can be statistically controlled and any wide variations outside these limits can be discovered and eventually remedied.

Application:

A range of yarn counts from 1/6s to 1/30s was spun on a conventional roller spinning frame from a very heavy roving. Unevenness tests were taken on the resulting yarn (see Table I).

Since, in Table I, the value of C has taken on a variable personality we may conclude that the spinning operation was not statistically controlled. If the value of C, which has become a variable, is plotted against draft for all values in Table I, a smooth curve will result.

It is evident that with rising draft the yarn becomes more uneven, i.e. as the draft increases, C increases. This result could mean that the original equation (5) is at fault, or that there are desirable drafts for best spinning.

As a further test, (Table II), 1/20s and 1/30s were next spun from a lighter roving, all other conditions equal. The resulting values of C correspond closely to the values obtained under similar drafts from spinning with the heavy roving. Thus, from the compatibility of results, equation (5) is not at fault, but there is a draft range (low in this case) in which a yarn will be of the best quality.

The 1/20s and 1/30s in Table II spun from the lighter roving are more even than the same yarn numbers spun from the heavy roving. At the same time the values of C corresponding to the drafts for the 1/20s and 1/30s spun from fine rovings are higher than the C's for the same draft using heavy roving. Thus, in the case of Table I, the combined effect of low roving draft and high spinning draft had a more harmful effect on yarn quality than did the combination of a higher roving draft and a lower spinning draft, as in Table II. In this case, then, we came to the conclusion that the lower the spinning draft, the better the average percent unevenness of the resulting yarn.

This result is not new but verifies that which has been practiced by experienced spinners for years. Following the above procedure, one may deduce desirable draft ranges for those spinning frames designed for high drafts. The method set is also equally applicable to all other drafting or drawing operations.

A 30-grain-per-yd sliver was found to have an average percent unevenness of 20. Converting 30 grains per yd into worsted count and substituting into equation (6), C is found to be 31.7. With this value of C a 20s worsted-count yarn spun eventually from the 30-grain-per-yd. sliver would be 140% uneven. Since the 20s yarn spun was only 60% uneven in reality, this result immediately leads to contradiction. The yarn is more even than the sliver, relatively speaking. This condition might have been possible had a number of doublings taken place during roving and spinning, but such was not the case. Consequently the yarn unevenness under the best possible spinning conditions should be 140% for 20s and practically even a greater value. It was later deduced after many tests that the only other cause for the incompatibility lay in the reading or interpretation of the tester charts themselves; for if the 30-grain-per-yd. sliver is subjected to a draft of 50 to produce 20s worsted count, then the short-term irregularities of the sliver become long-term variations in the yarn. These long-term variations, of which only one or two at most are included in a test chart of yarn, lay the basis for the maximum percent unevenness of the yarn. A sufficient length of 1/20s yarn was later tested and its maximum percent unevenness was 138%.

A further aid in comparing values of average percents unevenness follows from equation (3):

$$\text{Average percent unevenness} = \frac{A}{\sqrt{N_o}} \quad (3)$$

Where N_o is the average number of fibers in the yarn or sliver cross-section. Then since the number of fibers in the cross-section is proportional to the product of the groove-width and true average thickness of the yarn or sliver we have

$$\frac{U_1}{U_2} = \frac{\sqrt{W_2 \times T_2}}{\sqrt{W_1 \times T_1}} \quad (7)$$

where the U is average percent unevenness
W is groove width
T is true average thickness

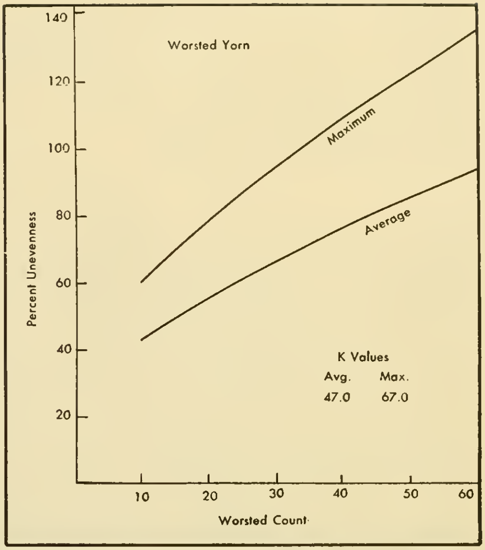
Or in the case where the same groove is used

$$\frac{U_1}{U_2} = \frac{\sqrt{T_2}}{\sqrt{T_1}} \quad (8)$$

Selling on Specifications—

A TW COMMENT

If you sell on specification, you've got to manufacture on specification. We believe that the current trend toward increasing use of evenness testers is a real contribution to the science of textile manufacturing. Up to now most of the specification buying of textile products has been by the government or by some industrial purchasers, but we believe that the day is not too far distant when much more purchasing will be based on specifications. That's why any contribution to the understanding of textile measurements is particularly important. This pair of articles on the Pacific tester is just an indication of the work that can be done.



58s-64s WOOL was the basis of this graph. Stock was at 14% regain plus 2% oil. For the 0.009-in. groove, worsted count equals 0.1080 divided by thickness. For the 0.012-in. groove, worsted count equals 0.0936 divided by thickness.

Mills Cooperate To Set Tentative UNEVENNESS STANDARDS

▶ When Pacific Mills learned of Mr. Chandler's handling of evenness-tester data (see page 96) they investigated his theories and found them to be sound. The next step, in cooperation with the manufacturer of the tester, Anderson Machine Shop, Needham Heights, Mass., was to use the new statistical tools to correlate data from many mills in an effort to set tentative standards. This article summarizes the work to date.

By RITA F. CASBY, Pacific Mills, Lawrence, Mass.

We of Pacific Mills believe that Mr. Chandler's work is an outstanding contribution to the correlation of evenness tests. There are two ways to use his formulas: 1) to bring individual mill results to a common level and thereby set up standards, 2) to analyze evenness-tester charts better. We have prepared a set of graphs to develop the first of these points.

How the Graphs Were Set Up

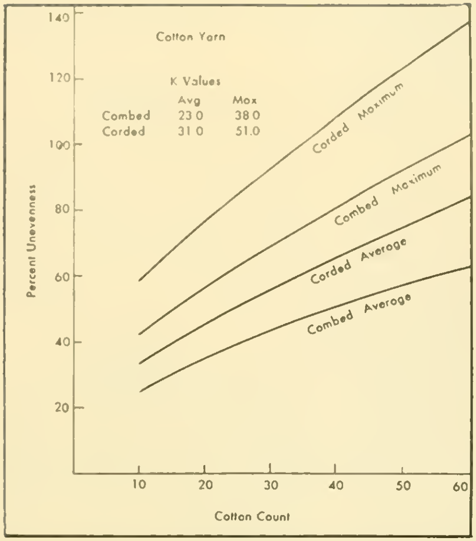
Dozens of mills, machinery manufacturers, and fiber producers sent in their evenness-tester results and we correlated all of the data by using Mr. Chandler's methods. The results of this investigation were divided into three groups: 1) worsted system, 2) cotton system, and 3) card or cut staple/pin drafter system.

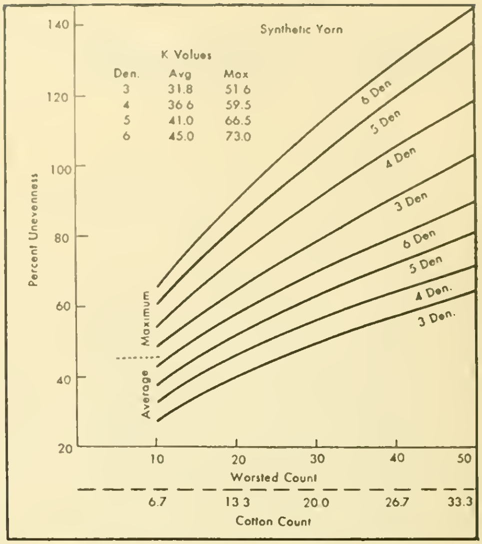
The average test length used was 20 yd. Grains per yard were used as the basis for the K-numbers to get away from the different systems of yarn numbering.

Standards for the worsted group of charts are based on 58s to 64s all wool. You can compare other wools and synthetics processed on the worsted system by allowing for the different staple lengths and fiber diameters.

Cotton standards come from a wide range of cotton and represent an average.

Synthetic-fiber standards are based on carded or cut staple fibers that were pin drafted and made into roving and yarn on either worsted or cotton frames. The charts of pin-drafter sliver are plotted according to staple length rather than fineness because the length of the fiber has more effect on evenness than does fiber diameter. For weights lighter than sliver, however, fiber diameter exerts a greater influence than length, so the charts for





A WIDE RANGE of cotton yarns was used as the basis for these curves. As might be expected, combed yarn shows lower values of unevenness than does carded yarn. The maximum unevenness of combed yarn, however, is higher than the average unevenness of carded yarn.

BOTH WORSTED AND COTTON systems of yarn making are included in the above data. Denier affects unevenness more than does length in weights lighter than sliver. Staple lengths of 3, 4½, and 6 in. were included in the tests. Graphs for synthetic sliver are plotted according to staple length, not denier.

roving and yarn are plotted according to diameter instead of length.

What the Graphs Show

Two conclusions have been reached as a result of this investigation. First, evenness constants (K-numbers) are inversely proportional to staple length. Second, evenness constants are proportional to the square roots of deniers.

How You Can Use the Graphs

1. To Check Your Operations

When you process a sliver or similar form through a machine, you can check the material fed and delivered and derive substantially the same K-numbers—provided nothing has occurred within the machine to affect uniformity. If you get different K-numbers, you'd better find what is causing the unevenness to be introduced at that process.

To make this check, you should perform regular tests and calculations on the material fed. If doublings are used, the entire feed should be tested together if the combined weight is within the range of the tester; otherwise lengths of each end fed should be tested and averaged. Then K-numbers should be calculated.

When testing the delivery end, be sure to use a test length equal to the feed test length times the draft. Instead of taking readings of highs and lows per yard, readings should be taken at each yard length times the draft. Then K-numbers are again calculated and compared with those of the feed.

(Note: to make the delivery-end calculations easier, run a closed-curve graph. The closed curve represents 20 yd. to the inch. For example, if your draft is five and you tested 20 yd. of the feed, you'd have to test 100 yd. of delivery and take high and low

K = B

The K referred to in Miss Casby's work is the same as the constant B in Mr. Chandler's formula (7).

$$K \text{ (or B)} = \text{Average percent unevenness} \times \sqrt{\text{grains per yd.}}$$

Make These Settings To Get Uneven Wool Yarns

Technical Editor:

We want to make a very uneven woolen yarn that ranges in size from ½ to 1 run. We have standard 60x60 tape-condenser cards with frame and mule spinning. So far, we can't make a yarn uneven enough. Do you have any suggestions? (9815)

Set the workers on the card this way:

1st Cylinder

1st worker—left side 22 gauge
right side 24 gauge
2nd worker—left side 24 gauge
right side 22 gauge

2nd Cylinder

1st worker—left side 24 gauge
right side 26 gauge
2nd worker—left side 26 gauge
right side 24 gauge

3rd Cylinder

1st worker—left side 26 gauge
right side 28 gauge
2nd worker—left side 28 gauge
right side 26 gauge

Apply different tensions on the tape condenser. Vary the number of rubs per minute on each bank by giving the aprons an uneven rub action.

readings every 5 yd., or at each ¼ in. of the closed curve. Long-range closed curves are also invaluable for visual comparisons.)

If an operation has altered evenness either way, the change in K-values will indicate such damage or improvement. If evenness has been maintained, K-numbers will be identical.

When you're setting up an operation and want to know what draft to use with what weight of feed, the K-numbers will tell you what combination is best as far as evenness goes.

2. To Compare Slivers, Rovings, and Yarns of Different Weights

If you want to compare materials of different weights that had to be tested in different grooves, you can use another of Mr. Chandler's formulas—the one that notes the inverse relationship of percent unevenness to the square root of groove width times thickness. (If groove width was the same, use the same formula and omit groove widths.)

The effect of doublings on evenness can be checked in the lighter slivers and in all rovings and yarns. For example, test three or four 50-gr. slivers in multiple, and then test the ends singly. If the K-numbers of both tests are the same, the doublings are not aiding evenness. We've found that doubling does not improve evenness as much as is generally believed. However, doublings do improve blending, weight control, and yarn appearance.

Analyze Chart Before Calculating

Take a long, hard look at your chart before figuring maximums, averages, or K-numbers. Cyclic variations should be investigated immediately, because calculations that include repeated fluctuations won't help you at all. You should make long-range closed-curve charts on all samples in order to pick up long-range cycles, weight drifts, and thick or thin spots. Analysis of these factors is just as important to chart analysis as are the calculations themselves.

How Much Should You Test?

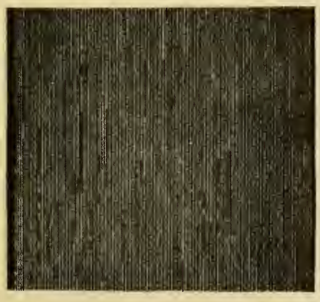
For regular testing and control work, 20 yd. has been found satisfactory to obtain dependable results. (It's also a convenient number to calculate.)

The number of samples depends upon individual mill requirements and is more a problem of statistical sampling than evenness testing. Long-range tests of sliver and top should be from 100 to 200 yd. of roving and from 200 to 400 yd. of yarn. Evenness need not be calculated from these, but where weight or thickness variations occur, mean lines should be drawn through the heavy or light sections and the distance from the graph mean calculated to derive the error of weight.

How About Maximums

Maximum percentages of unevenness are based on the 20-yard. test length. Neps, turnbacks, piecings, and other irregular deviations may be discarded in the calculation unless their effect is desired. Most of these defects are eliminated in slub catchers or similar devices. For example, when a sliver has been processed normally and without frequent breakdowns, a piecing that falls within the test length should be discarded in calculations. If a machine is running with frequent breakdowns, however, piecings should be calculated to show their effect. Warning: when certain maximum deviations are discarded, be sure to make a note of the omission to accompany the results.

Maximums are very important because they indicate defects that can show in the finished cloth. Maximums and minimums also cause breaks in spinning, winding, and weaving.



SAMPLE STANDARD for worsted-yarn evenness. This is Grade A—a 1/30s made from 100% Australian 70's wool.

Photographic Standards For Wool Yarns

For years there have been photographic standards for cotton-yarn evenness, but no standards exist for other yarns on other systems. We've developed our own standards and find this method very effective in grading yarns.

We photograph samples of each yarn number from each lot. After many months we have been able to establish these standards:

A — excellent
A– — very good
B+ — good
B — fair
C — poor

The yarn is wound on a seriplane and graded. Then we take a picture of the sample to compare with our standards. Dull photographs are preferable.

The system is in use for wool, nylon, Vicara, dynel, Dacron, and all blends of these fibers. Our quality is up, and our customers are happier. *Roland Ferron, Manchester, Conn.*

Two Ways To Make Nubs

Technical Editor:

Our mill is going into nubby tweeds and I would like to know the best way to mix the nubs. (9769)

There are several ways to handle nubs, but the best way is to use a nub box on the top of the finisher card. This box is similar to a trough, and it is driven from a worker through a set of gears. By adjusting the gears and setting the nub box feed roll, you can get as many nubs as far apart as you want. Set the following workers up, and forget about the finisher as a carding machine.

Another way is to put the nub box on the first breaker. Set the workers off, and get the carding action between the ring doffer and the cylinder.

Regular Reclothing of Cards Can Save $2,200 per Year

Technical Editor:

We're having a hard time convincing our boss carder that it's wise to reclothe the woolen card regularly. Any suggestions? (9770)

Try this simple dollars-and-cents argument:

A mill running its cards at 50 lbs. per hr., two 40-hr. shifts, 50 weeks per year is producing 200,000 lbs. per card per year. If the cost is 10¢ per lb., the card production costs $20,000 per year.

Now, if the card has to be slowed down 10% because of old clothing, the production is 45 lbs. per hr. and the cost is 11¢ per lb. If you figure out the difference, you will see that the mill is losing $2,200 per card per year because the cards weren't reclothed regularly.

Attachment Eliminates Jerk-Backs on C-4 Tricolor Looms

When we ran our C-4 tricolor looms as 4x2 looms, we always had a lot of trouble with jerk-backs caused by waste yarn from the bobbin being transferred. Now, we use an attachment to hold the exhausted filling end away from the loom until the temple knife cuts the end.

The attachments, one for each loom, were made in our mill machine shop from steel stock on hand. To make the attachments:

1. Use cold-rolled flat-steel stock $12\frac{3}{4}$ ins. long, $\frac{7}{8}$ in. wide, and $\frac{1}{8}$ in. thick to form a hook. (Drop-wire separator bars will do.) Bend the bar as shown in Fig. 1. Cut a hook to hold the filling end in one end of the material. Cut a $\frac{7}{16}$-in. slot in the other end and smooth the surfaces with fine emery cloth.

Fasten the slotted end to the protector-rod stop with the capscrew and check nut as illustrated in Fig. 2. Have the hooked end as close as possible to the binder stop without rubbing. The top of the hook should be about $1\frac{1}{8}$ ins. above the top of the shuttle box.

2. Make another hook from a 5-in. length of $1\frac{3}{4}$-in. cold-rolled flat-steel stock $\frac{1}{8}$ in. thick. Slot one end, and cut the other end to form a hook as shown in Fig. 3. Drill a hole with a No. 29 drill in the magazine-frame guard as shown in Fig. 4, and tap the hole with a No. 8-32 tap.

Screw the slotted end of the hook to the magazine-frame guard.

3. Make a third hook from $\frac{1}{16}$-in. flat stock, as shown in Fig. 6, and bend it at a 45° angle. Drill two holes in the top of the shuttle box at the binder stop, and tap them with a No. 8-32 tap. Then screw the hook to the box top as shown in Fig. 5. This hook is to allow the filling to clear the long upright hook when the lay moves back after the transfer.

After all the hooks are placed on the loom, set the magazine for transferring the filling and bring the lay to the front-center position. Then adjust the hooks as shown in Fig. 6.

When the attachment is adjusted properly, the yarn from a bobbin being transferred is threaded into the hook fastened to the magazine-frame guard and held there until the thread cutter at the temple cuts the yarn. There is no possible way for the yarn to be woven into the cloth. *Stephen Vernarec, Wallington, N. J.*

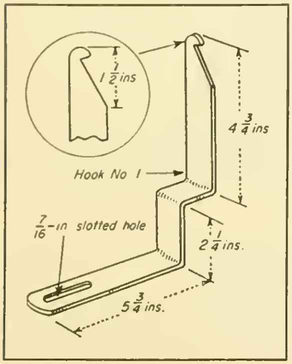


Fig. 1

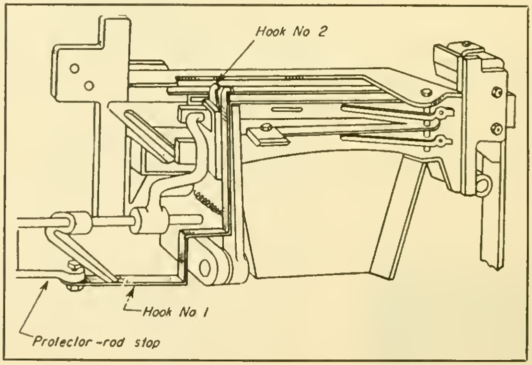


Fig. 2

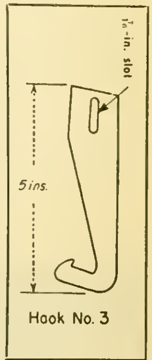


Fig. 3

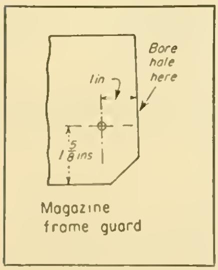


Fig. 4

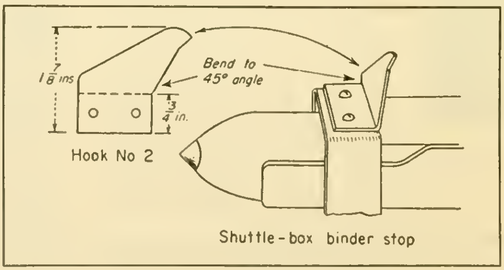


Fig. 5

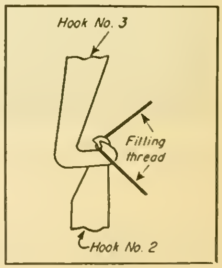


Fig. 6

Date Due

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